MOTOROLA

MCT-1200™ AND METROCOM II™

Mobile Communications Terminal

Instruction Manual

68P81039E60-C

COMMERCIAL WARRANTY
(STANDARD)

Motorola radio communications products are warranted to be free from defects in material and workmanship for a period of ONE (1) YEAR, (except for crystals and channel elements which are warranted for a period of ten (10) years) from the date of shipment. Parts, including crystals and channel elements, will be replaced free of charge for the full warranty period but the labor to replace defective parts will only be provided for One Hundred-Twenty (120) days from the date of shipment. Thereafter purchaser must pay for the labor involved in repairing the product or replacing the parts at the prevailing rates together with any transportation charges to or from the place where warranty service is provided. This express warranty is extended by Motorola Communications and Electronics, Inc., 1301 E. Algonquin Road, Schaumburg, Illinois 60196, to the original purchaser only, and only to those purchasing for purpose of leasing or solely for commercial, industrial, or governmental use.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED WHICH ARE SPECIFICALLY EXCLUDED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MOTOROLA BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW.

In the event of a defect, malfunction or failure to conform to specifications established by seller, or if appropriate, to specifications accepted by Seller in writing, during the period shown, Motorola, at its option, will either repair or replace the product or refund the purchase price thereof, and such action on the part of Motorola shall be the full extent of Motorola's liability hereunder.

This warranty is void if:

a. the product is used in other than its normal and customary manner;
b. the product has been subject to misuse, accident, neglect or damage;
c. unauthorized alterations or repairs have been made, or unapproved parts used in the equipment.

This warranty extends only to individual products, batteries are excluded, but carry their own separate limited warranty. Because each radio system is unique, Motorola disclaims liability for range, coverage, or operation of the system as a whole under this warranty except by a separate written agreement signed by an officer of Motorola.

Non-Motorola manufactured products are excluded from this warranty, but subject to the warranty provided by their manufacturers, a copy of which will be supplied to you on specific written request.

In order to obtain performance of this warranty, purchaser must contact its Motorola salesperson or Motorola at the address first above shown, attention Quality Assurance Department.

This warranty applies only within the United States.

EPS-27734-O

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EPS-34440-A

68P81112E94-A

MOTOROLA INC.

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81039E60-C MCT-1200 AND METROCOM II Mobile Communications Terminal

REVISION DETAILS:

1. The Model Chart (EPS-35751) is revised to show a change in the description of item TRN8721A (see attachments).

2. Option D131AC Lockswitch is added to the option chart (see attachments).

3. The first NOTE on page 4 of the operation section is revised (see attachments).

4. Refer to the attached PEPS-32713-B (Sheet 2 of 3). Revisions on this sheet are as follows:

ITEM	REVISION
PL-6627-A	Part No. Correction
PL-7106-C	Part List Title
PL-8468, 8469, 8503, 8504, 8505 and 8524	Added

5. The internal wirng of the mobile data terminal handset and the interconnect cabling between the MPU board and the vehicle location receiver are changed. Refer to the attached Interconnect Cabling Diagram (PEPS-32713-B Sheet 2 of 3) for details.

6. Refer to the attached PEPS-27741-E (Sheet 2 of 4). Values of the following resistors changed: R201-205, 235, 371, 207-211, 254, 370 and 373.

7. Refer to the attached PEPS-27741-E (Sheet 3 of 4). Revisions on this sheet are as follows:

ITEM	REVISION
PL-6356-E	K201 Part No. L3 added R201-205, 207-211, 253, 254, 330, 370 and 371 Part No. and value. U220-224, 227, 228 and 235 Part No.
PL-6366-D	Parts List Title
PL-6608-0	Deleted
PL-8523-0	Added

NOTE

All other attached sheets are the same as the previous issue.

DO NOT DISCARD THE EXISTING PAGE IN YOUR MANUAL. THE PERFORMANCE SPECIFICATIONS ON THE REVERSE SIDE ARE STILL APPLICABLE.

MODEL CHART

FOR

MCT-1200 AND *METROCOM II*

MOBILE COMMUNICATIONS TERMINAL

(CURRENT MODELS)

CODE:

● = QUANTITY OF ONE SUPPLIED

/ = QUANTITY OF ONE PER 20 UNITS

MODEL DESCRIPTION	T1940C MOBILE DATA TERMINAL w/o LCD	T1941C MOBILE DATA TERMINAL w/LCD	T1964B MOBILE DATA TERMINAL ACCESSORIES	ITEM	DESCRIPTION
	●	●		THN6382A	TOP HOUSING KIT
	●			TLN2020A	FRONT PANEL KIT (w/o LCD)
	●			TRN8718A	DISPLAY AND SWITCHBOARD
	●			TRN8719A	FRONT PANEL HARDWARE
		●		TLN2019A	FRONT PANEL (w/LCD)
		●		TRN8713A	DISPLAY AND SWITCHBOARD
		●		TRN8714A	FRONT PANEL HARDWARE
	●	●	●	TMN6143A	HANDSET (ARMORED CABLE)
	●	●	●	TRN4471A	FILTER BOARD
	●	●	●	TRN4468A	TRAY HARDWARE
	●	●		TRN8715A	MPU BOARD
	●	●		TRN8720A	HARDWARE AND HOUSING
	●	●		TRN8721A	FIRMWARE KIT
		●		TRN5530A	ESCUTCHEON (STD w/LCD)
	●			TRN5529A	ESCUTCHEON (STD w/o LCD)
	●	●	●	TRN8777A	HANG-UP CLIP
	●	●	●	TRN8793A	INSTALLATION HARDWARE
	●	●	●	TKN6458A	CABLE AND FUSE KIT
	●	●	●	TKN8127A	RADIO CABLE KIT (20 FT.)
	●	●	●	TKN8130A	CABLE, ALARM
	●	●	●	TKN8126A	CABLE, POWER
	/	/	/	TRN8794A	GENERAL TOOL KIT
	●	●	●	TRN4473A	LOCK KIT (KEY NUMBER 2135)
	●	●	●	TRN4474A	LOCKSWITCH KIT (KEY NUMBER 2135)

EPS-35751-A

DO NOT DISCARD THE EXISTING PAGE IN YOUR MANUAL. THE OPTION CHART ON THE REVERSE SIDE IS STILL APPLICABLE.

CAUTION

Some options exclude others and some have to be chosen in pairs. For a compatibility check, contact a Motorola Sales Office.

OPTION CHART (CONT'D.)

Model	Kit Added	Kit Omitted	Description
		D176AA Mitrek Radio Cable	
T1940, T1941 T1964	TKN8243A	TKN8127A	Allows connection to negative ground *Mitrek* radio set.
		D177AA Mitrek Radio Positive Ground	
T1940 T1941 T1964	TKN8077A TRN4239A TRN4240A TRN4472A	TRN4471A	Allows connection to positive ground *Mitrek* radio set. **CAUTION:** This option must go together with D176AA.
		D178AA Omit Hang-Up Clip	
T1940 T1941 T1964		TRN8777A	Deletes the Hang-Up Clip
		D180AA Omit Handset	
T1940 T1941 T1964		TMN6143AA	Omits the handset and armored cable.
		D175AA Remote Entry of Unit ID	
T1941	TRN5135AA	TRN8721A	Allows entry of variable ID from the fixed end.
		D131AC Lockswitch	
T1941 T1940 T1964	TRN4893A	TRN4474A	Replaces standard lockswitch no. 2135 with optional lockswitch no. 2252.

DO NOT DISCARD THE EXISTING PAGE IN YOUR MANUAL. THE TEXT ON THE REVERSE SIDE IS STILL APPLICABLE.

NOTE

Should a dispatcher PA message be received by the terminal during driver PA operation, the driver PA is turned off. Receipt of a selective call during a driver PA does not interrupt the PA operation but activates the beeper and CALL LED. The driver has to exit the driver PA mode in order to respond to the call.

3.5 EMERGENCY ALARM

A dash mounted alarm switch is installed in the vehicle. Familiarize yourself with the exact location of this switch. In case of an emergency on board the vehicle, depress and release the alarm switch. The terminal transmits (without turning on the TX indicator) an emergency alarm message to the dispatch center. The dispatcher center continues to receive automatic emergency alarms until it is acknowledged (without turning on the ACK indicator).

3.6 FALLBACK OPERATION

3.6.1 In the event of a computer or data channel shut down, the terminal enables the PA speaker. The dispatcher can then have normal two-way voice communication to the vehicle.

3.6.2 To indicate a need for voice communications, follow the instructions outlined in the Voice Communications Requests paragraph.

NOTE

During fallback operation, if the REQUEST or PRIORITY switch is depressed, the ACK indicator does not turn on. The CALL indicator turns on and 5 seconds of beeping is heard. Since the dispatcher PA speaker is enabled during the fallback mode, the driver PA function is disabled.

3.7 OPTIONAL MESSAGE CAPABILITY OPERATION

Terminals equipped with this option have a control panel similar to that shown in Figure 2. Up to five switches (M1, M2, M3, M4, and M5) may be present and are located in the designated positions. The switch function, when activated, sends a message to the dispatcher. The specific message is predefined by the customer and varies from system to system. The following is a general procedure:

Step 1. Depress any of the five message switches. Observe that an audible beep is heard.

Step 2. Observe that a second audible beep is heard. (This indicates message receipt by the computer.)

NOTE

Message capability is inoperative in the fallback mode.

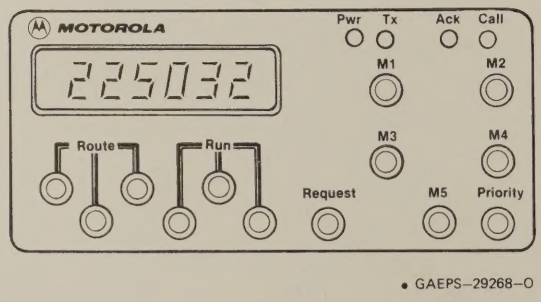
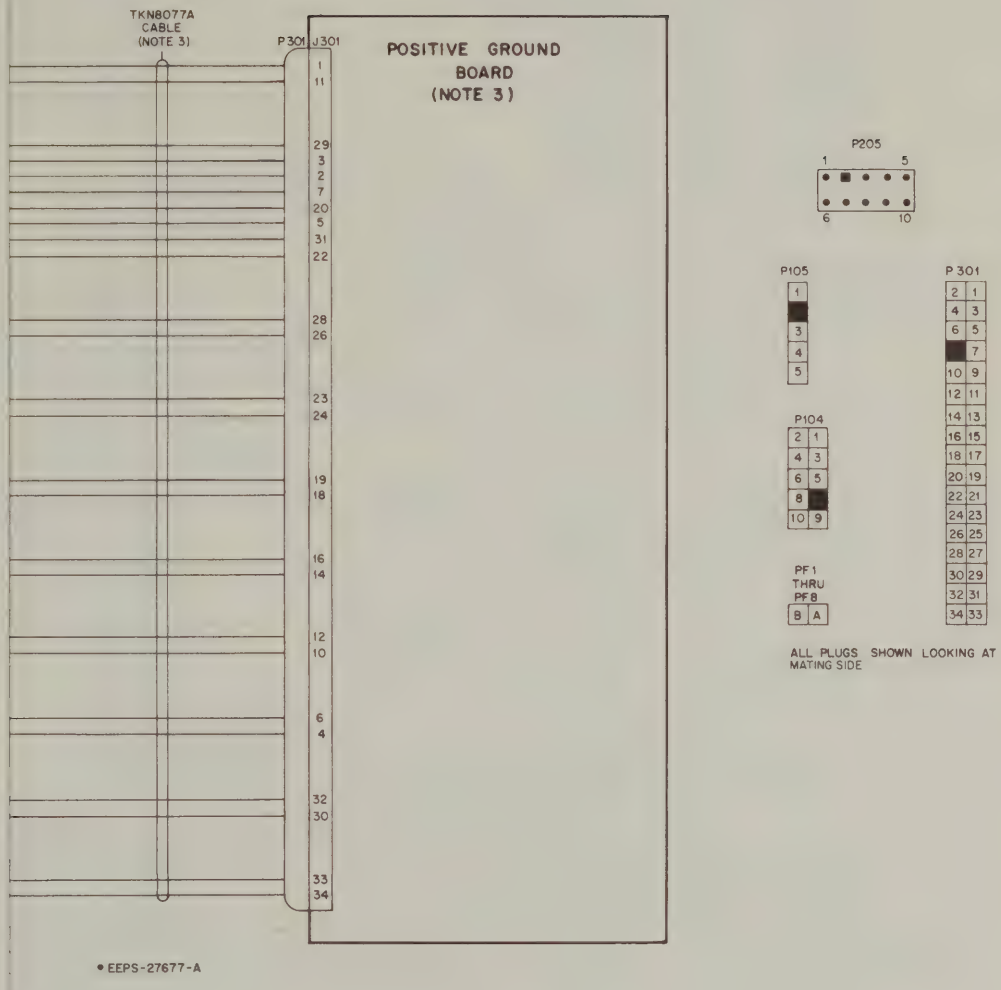


Figure 2. Control Panel With Message Switches



• EEPS-27677-A

Mobile Data Terminal
Interconnect Cabling Diagrams,
Filter Board Schematic Diagram
and Circuit Board Detail,
and Parts Lists
Motorola No. ***PEPS-32713-B***
(Sheet 1 of 3)
5/25/83-PHI

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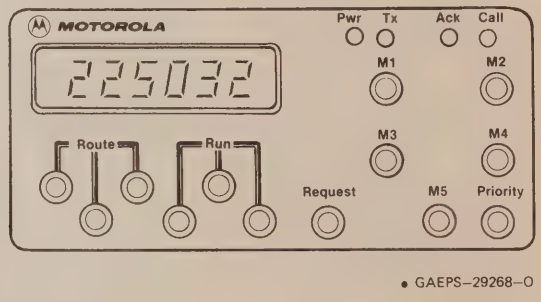

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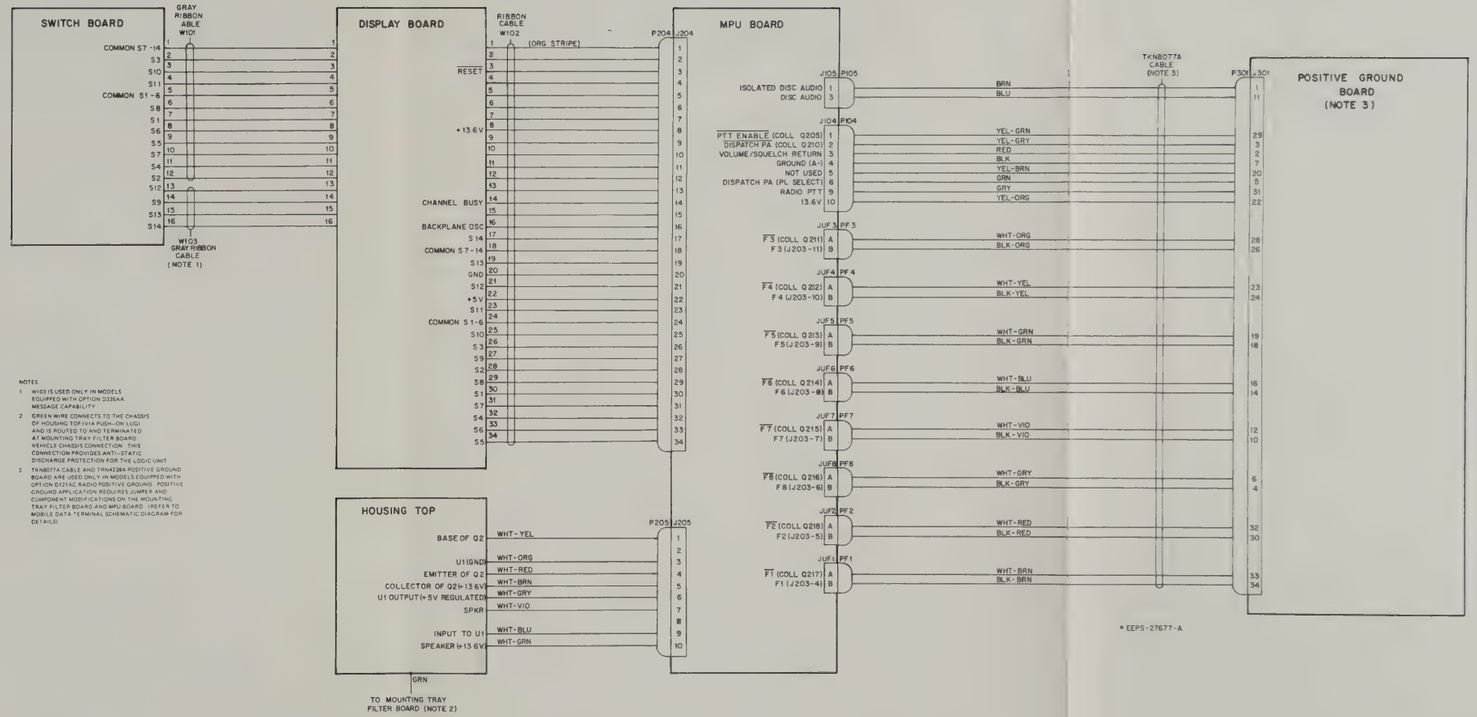

NOTES

1. W103 IS USED ONLY IN MODELS EQUIPPED WITH OPTION D335AA MESSAGE CAPABILITY.
2. GREEN WIRE CONNECTS TO THE CHASSIS OF HOUSING TOP VIA PUSH-ON LUG! AND IS ROUTED TO AND TERMINATED AT MOUNTING TRAY FILTER BOARD VEHICLE CHASSIS CONNECTION. THIS CONNECTION PROVIDES ANTI-STATIC DISCHARGE PROTECTION FOR THE LOGIC UNIT.
3. TKN8077A CABLE AND TRN4238A POSITIVE GROUND BOARD ARE USED ONLY IN MODELS EQUIPPED WITH OPTION D321AC RADIO POSITIVE GROUND. POSITIVE GROUND APPLICATION REQUIRES JUMPER AND COMPONENT MODIFICATIONS ON THE MOUNTING TRAY FILTER BOARD AND MPU BOARD. (REFER TO MOBILE DATA TERMINAL SCHEMATIC DIAGRAM FOR DETAILS)

Mobile Data Terminal
Interconnect Cabling Diagrams,
Filter Board Schematic Diagram
and Circuit Board Detail,
and Parts Lists
Motorola No. ***PEPS-32713-B***
(Sheet 1 of 3)
5/25/83-PHI

parts list

TRN8793A Installation Hardware Kit — PL-6373-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-844417	NUT, strip; 6 used
	3-13948	SCREW, machine; 10-32 x 5/8"; 6 used
	4-7565	WASHER, flat; 0.219 x 0.500 x .048; 6 used
	5-10115A43	GROMMET, rubber
	54-84697B01	LABEL

TRN8720A Housing Hardware Kit — PL-6369-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-129892	NUT; 8-32 x 5/16 x 1/8" hex; 4 used
	3-124074	SCREW, machine: 8-32 x 1/2"; 4 used
	3-135506	SCREW, tapping; 6-32 x 1/4"; 8 used
	3-138891	SCREW, tapping; 6-32 x 7/16"; 4 used
	3-827399M01	SCREW, machine; 10-32 x 2-1/4"; 2 used
	3-84969M01	SCREW, captive; 4 used
	15-82288M01	HOUSING, bottom
	15-82289M01	HOUSING, rear
	32-84571L02	GASKET, .125 O.D. x .085 I.D.; 53"
	33-82745M01	NAMEPLATE
	42-10128A15	RETAINER, ring; 2 used
	42-82883M01	CLIP, circuit board; 4 used
	43-82668M01	BUSHING, lock
	43-83414M01	SPACER; 4 used
	9-84181L01	SOCKET, 2 contact

TRN8804A Alarm Switch, Panel Mounting — PL-6627-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		switch:
	40-82608M02	spst, pushbutton
		mechanical part
	54-84697B01	LABEL

TRN4247A and TRN4279A Jumpers — PL-7459-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	9-84181L01	SOCKET, 2 contact, (TRN4247A 5 used) (TRN4279A 1 used)

TKN8126A Power Cable (20') — PL-7054-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F1	65-86099	7.5 amp; 32 V
		connector, plug: consists of:
P1	15-10183A74	HOUSING, connector; 2 position
	39-10184A01	CONTACT, receptacle; 2 used
		non-referenced items
	14-82882A01	INSULATOR, fuse holder body
	14-82883A01	INSULATOR, fuse holder cap
	41-82885A01	SPRING, fuse compressor
	42-82884A01	CLIP, fuse
	30-82775M01	CABLE, 2 conductor; 20' used

Mobile Data Terminal
Interconnect Cabling Diagrams,
Filter Board Schematic Diagram
and Circuit Board Detail,
and Parts Lists
Motorola No. PEPS-32713-B
(Sheet 2 of 3)
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TKN8127A/TKN8128A Radio Cable (20') — PL-7062-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug: consists of:
P3	15-83498F37	HOUSING, connector: 6 position
	29-83452L01	TERMINAL, female; 4 used
	43-84798F01	POLARIZING KEY; 1 used
P203	14-84556B02	HOUSING, connector: 22 position
	9-84151B03	RECEPTACLE, contact; 19 used
P204	9-84086B01	RECEPTACLE, female; 37 contact
	9-84151B03	RECEPTACLE, contact; 23 used
	15-84044C03	HOUSING, receptacle (front)
	15-84045C01	HOUSING, receptacle (rear)
		non-referenced items
	3-132127	SCREW, tapping: 6-20 x 3/4"
	3-139999	SCREW, tapping: 6-19 x 3/8"; 2 used
	3-140000	SCREW, tapping: 6-19 x 3/4"
	30-813233	CABLE, battery: red; 22' used
	30-831572	CABLE, battery: blk; 22' used
	30-83272E01	CABLE, 20 conductor; 22' used
	42-84933E01	CLAMP, strain relief
	54-84698B01	LABEL, negative ground

TKN8129A Radio Cable (20')
TKN8243A Radio Cable (22') — PL-7483-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug: consists of:
P3	15-83498F37	HOUSING, connector: 6 position
	29-83452L01	TERMINAL, female; 5 used
	43-84798F01	POLARIZING KEY; 1 used
P203	14-84556B02	HOUSING, connector: 22 position
	9-84151B03	RECEPTACLE, contact; 15 used
P204	9-80169C01	RECEPTACLE, female; 19 contact
	15-82075D01	HOUSING, plug (right hand)
	15-82075D03	HOUSING, plug (left hand)
		non-referenced items
	3-132127	SCREW, tapping: 6-20 x 3/4"; 2 used
	2-129924	NUT, hex: 4-40 x 1/4" x 3/32"; 2 used
	3-131758	SCREW, machine: 4-40 x 1-1/8"; 2 used
	3-867088	SCREW, cover retaining
	4-11722	WASHER, "C"
	4-800671	WASHER
	4-82113D01	WASHER, felt
	36-867087	KNOB, retainer
	30-812505	CABLE, battery: red; 22' used
	30-851575	CABLE, battery: blk; 22' used
	30-83272E01	CABLE, 20 conductor; 22' used
	42-864148	STRAIN RELIEF

TKN8130A Alarm Cable Kit (15') — PL-7056-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug: consists of:
P2	15-83498F36	HOUSING, connector; 11 position
	29-83452L01	TERMINAL, contact: female; 9 used
	43-84798F01	INSERT, polarizing key
P201		consists of:
	14-84556B01	HOUSING, connector: blk
	9-84151B03	CONTACT, receptacle; 9 used
	9-84151B05	CONTACT, receptacle; 11 used
		non-referenced items
	30-82091M01	CABLE, 14 conductor; 15' used

TKN6458A Cable and Fuse Kit — PL-6474-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F1	65-84161B01	40 amp; 32 V
		mechanical parts
	3-400465	SCREW, tapping; 10-12 x 3/4"
	3-84277B02	FUSEHOLDER
	38-84383D01	CAP, protective
	42-84275B01	RETAINER, fuse
	54-84697B01	LABEL
	29-84528B05	LUG, ring tongue

TRN8775A Escutcheon — PL-6371-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	5-82781M01	RIVET, nylon; 2 used
	13-82387M02	ESCUTCHEON
	38-83037M01	RUBBER BUTTON; display; 8 used
	43-82766M01	SPACER
	61-82390M03	LENS, led; 4 used

TMN6143A Handset Armored Cable
TMN6144A Handset Coil Cord Cable — PL-6362-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		cartridge, microphone:
DP1	59-82933C02	Dynamic
DP2	59-84058A01	Impedance; 150 ohm (receiver headset)
		resistor, fixed:
R1	6-124C23	82 ± 10%; 1/4 W
		switch:
S1	40-83985F01	spst
		mechanical parts
	3-124432	SCREW, machine: 4-40 x 1/4"; 2 used
	7-84427G01	BRACKET, cable
	15-84053A01	COVER, switch
	15-84107A16	HOUSING, handset with cap
	29-847033	LUG, insulator; 3 used
	32-82942B03	GASKET, "O" ring
	42-10217A02	STRAP, tie; 2 used
	3-2950	SCREW, machine: 4-40 x 1/4" (THN6144A)
	42-82782A01	CLAMP, ground (THN6144A)
	42-83980F01	RETAINER (THN6144A)
	3-2950	SCREW, machine: 4-40 x 1/4"
	30-864145	SCREW, 5-conductor; 59" used (TMN6143A)
	30-83847E02	SCREW, armor; protection 48" used (TMN6143A)
	30-82565B35	CABLE, coil cord (TMN6144A)

TRN4471A/TRN4472A Filter Board — PL-7048-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1, 2	23-82077C25	capacitor, fixed: 500 uF + 75-10%; 60 V
CR1	48-82525G02	diode: (see note) silicon
CR2	48-84250L02	rectifier
J1	28-84645M01	connector, receptacle: male, 2-contact
J2	28-84646M02	male, 11-contact
J3	28-84646M01	male, 6-contact
J4	—	consists of:
	29-84547B03	PIN, contact; 2 used
	42-84067C01	RETAINER, connector
L1, 2	25-84379L07	coil: choke, 350 uH
		mechanical parts
	2-131435	NUT, hex: 4-40 x 1/4 x 3/32"; 2 used
	3-138613	SCREW, machine: 4-40 x 3/8"; 4 used
	4-9777	WASHER, split lock #4; 2 used
	31-82891M01	STRIP, terminal; 5-terminal; 3 used
	42-82919M01	CLIP, mounting; 2 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN4468A/TRN4469A/TRN4470A Tray Hardware Kit — PL-7106-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-121841	NUT, hex: 6-32 x 5/16 x 7/64"; 4 used
	3-135506	SCREW, tapping: 6-32 x 1/4"; 6 used
	3-136993	SCREW, machine: 6-32 x 3/8"; 2 used
	3-84630M01	SCREW, captive; 4 used
	4-1719	WASHER, flat; 2 used
	4-7652	WASHER, lock: #10 ext.; 4 used
	4-129021	WASHER, lock: #3/4 int.; 2 used
	4-131332	WASHER, flat: .266 x .500 x .036"; 2 used
	4-873839	WASHER, spring; 2 used
	5-101-5A43	GROMMET, rubber
	7-83248L03	BRACKET, locking
	7-84629M01	TRAY, mounting (TRN4468A)
	41-84756L01	SPRING; 2 used
	42-861179	CLIP, cable: 5/16" ID
	42-10217A02	STRAP, tie
	42-82143C02	CLAMP, cable: 1/4" ID
	42-82143C08	CLAMP, cable: 3/8" ID
	42-82846M01	CLAMP, cable: .317-.327 ID
	7-84629M02	TRAY, mounting (TRN4470A only)
	3-84630M02	SCREW, captive; 4 used
	64-84804M01	PLATE, mounting
	42-82846M03	CLIP, cable (TRN4468A, TRN4470A)
	42-82143M03	CLIP, cable (TRN4469A)
	7-84629M03	TRAY (TRN4469A)
	9-82672G01	RECEPTACLE, 8-contact (TRN4469A)
	64-84804M01	PLATE, mounting

TRN8777A Clip Hang-up — PL-6367-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-139471	SCREW, cap: 6-32 x 1" hex; 2 used
	41-82712K01	SPRING; hang-up
	55-82903M01	HANDLE; handset
	55-82903M02	HANDLE; handset

TRN8792A Escutcheon — PL-6625-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	13-82387M03	ESCUTCHEON (TRN8792A)
	38-83037M01	RUBBER BUTTON display; 2 used
	43-82766M02	SPACER
	61-82390M03	LENS, led
	5-82781M01	RIVET, nylon; 2 used

QKN7259A Radio Cable (22') — PL-8325-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
P3	15-83498F37	connector, plug; consists of: HOUSING, connector; 6-position
	29-83452L01	TERMINAL, female; 4 used
	43-84798F01	POLARIZING KEY; 1 used
P203	14-84556B02	HOUSING, connector; 22-position
P204	9-84151B03	RECEPTACLE, contact; 17 used
	15-80215B01	HOUSING, connector-front
	15-80216B01	HOUSING, connector-back
	9-80227B01	CONTACT, female; 2 used
	9-84151B03	RECEPTACLE; 25 used
		mechanical parts
	3-140079	SCREW, tapping; 6-19 x 1/2"; 4 used
	30-812505	CABLE, battery: RED; 22' used
	30-851875	CABLE, battery: BLK; 22' used
	30-83272E01	CABLE, 20" conductor; 22' used
	32-83859M01	GASKET, connector
	36-80220B01	KNOB, connector
	42-80156B01	RETAINER
	54-84032M02	LABEL

TRN5529A Escutcheon No.1
TRN5530A Escutcheon No. 2 — PL-8326-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	5-82781M01	RIVET, nylon; 2 used
	13-84297N01	ESCUTCHEON (TRN5529A)
	13-84297N02	ESCUTCHEON (TRN5530A)
	43-84280N01	SPACER
	64-84279N01	PLATE, escutcheon

TRN8794A General Tool Kit — PL-8503-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	66-82846D01	TUNING TOOL
	66-83226F01	SPECIAL HEX WRENCH
	66-84690C01	CONTACT REMOVAL TOOL

TRN8801A Buzzer — PL-8524-O

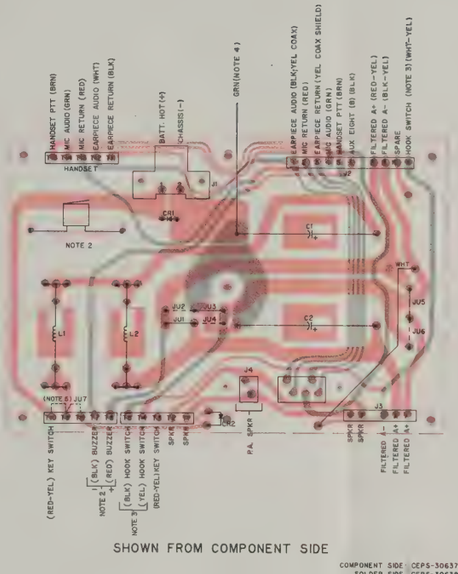
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-7041	NUT, hex 2-56 x 3/16" x 1/16"; 2 used
	3-1578	SCREW, 2-56 x 5/16"; 2 used
	4-8406	WASHER; 2 used
	80-84183L02	BUZZER

TRN4476A Lockswitch — PL-8504-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	40-82220H01	LOCKSWITCH (No. 2141)

TRN4475A Mechanical Lock — PL-8505-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	55-84737L05	LOCK (No. 2418)



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE CEPS-30637-O
SOLDER SIDE CEPS-30638-O
GL DEPS-30639-D

FILTER BOARD

NOTES:

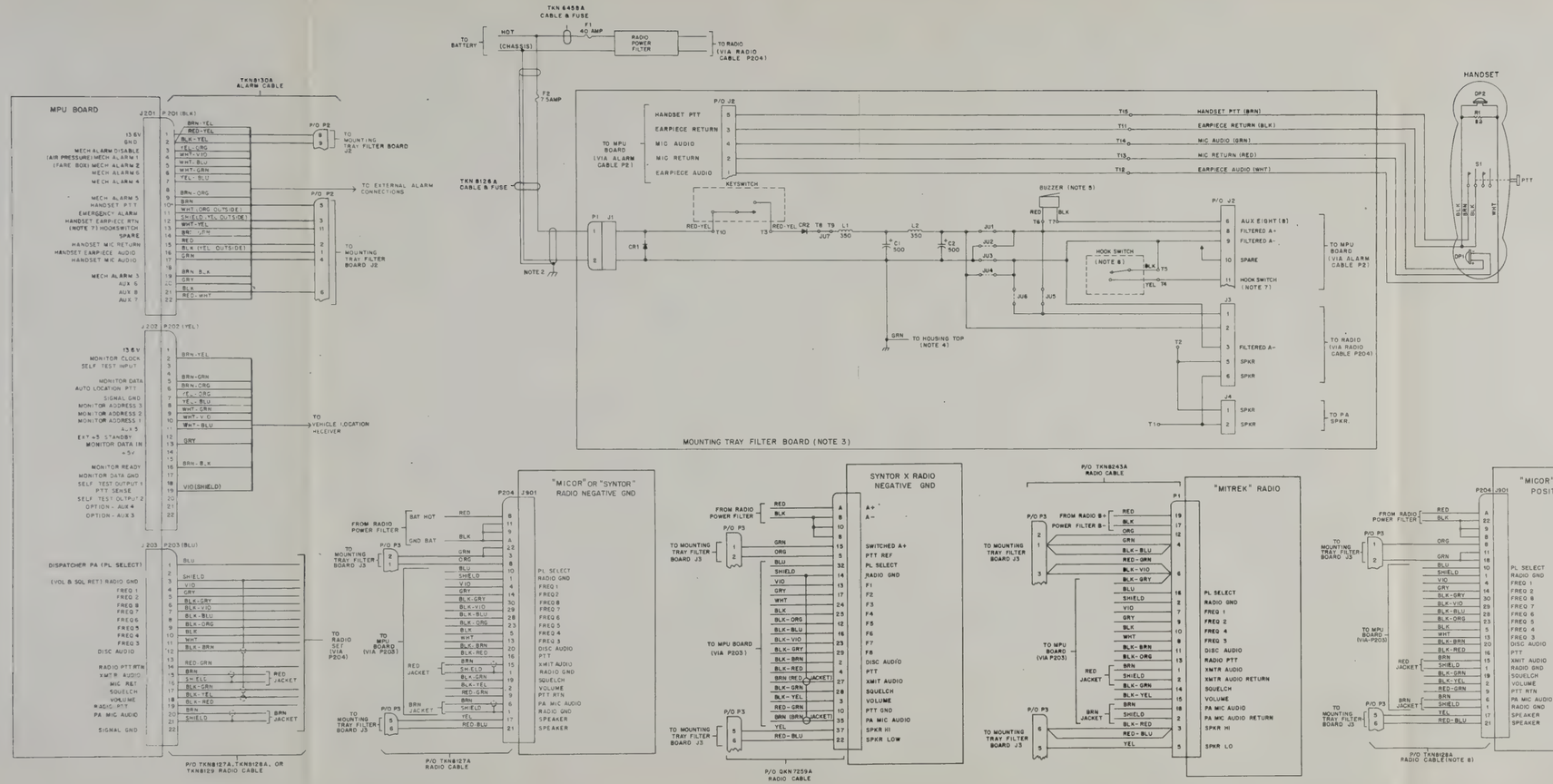
1. Connections are shown for negative ground (TRN4471A). For positive ground (TRN4472A), remove JU1, JU3, and JU5, and install JU2, JU4, and JU6. Reverse polarity of C1, C2, CR1 and CR2. For positive ground installations using MITREK radios with TKN8043A the filter board differs from TRN4472A as follows:
   JU5 — IN
   JU6 — OUT
2. TRN8801 Buzzer is optional for MCT-1200/Metrocom II only.
3. Hookswitch is optional for Metrocom Plus only.
4. GRN wire used in MCT-1200/Metrocom II and Metrocom Plus only. GRN wire connects to vehicle chassis (via screw in mounting tray) and is routed to and terminated at logic unit housing top (chassis). This connection provides anti-static discharge protection for the logic unit.
5. Jumper used in SPU-1200 processor only.

TRN4473A Lock Kit — PL-8468-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	55-84737L01	LOCK, key number 2135

TRN4474A Lockswitch Kit — PL-8469-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	40-82220H02	SWITCH, lock (key number 2135)

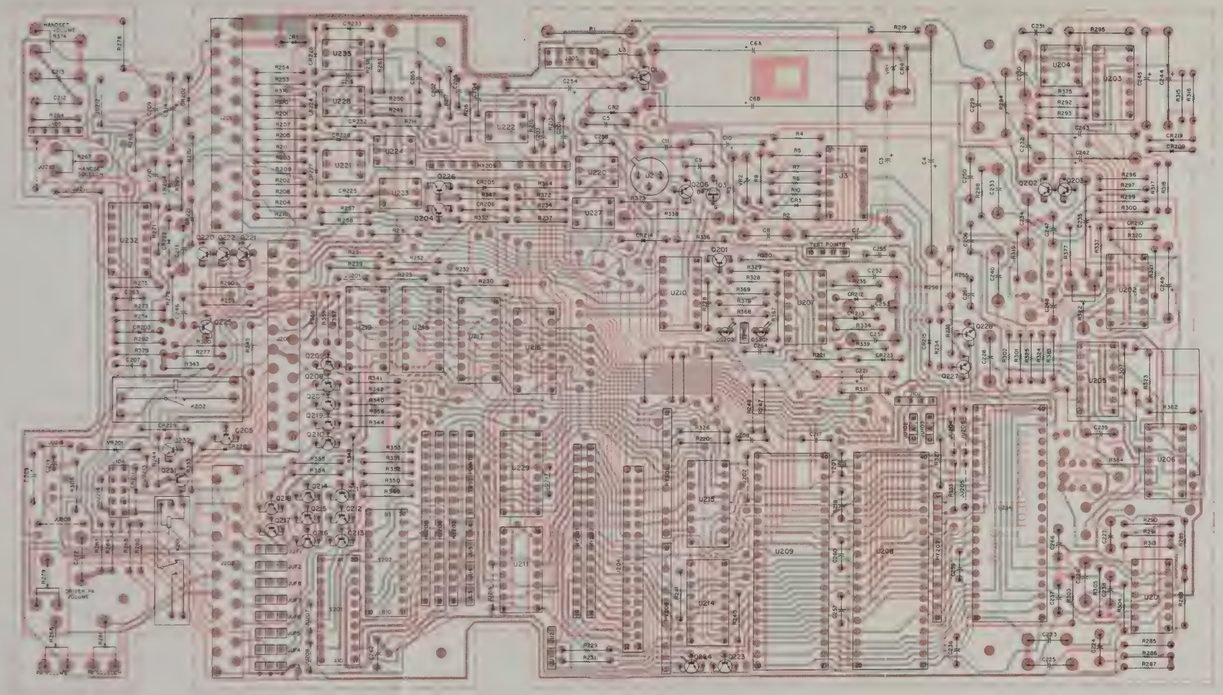


Jumper	Negative Ground	Positive Ground (See Note 9)
JU1	X	
JU2		X
JU3	X	
JU4		X
JU5	X	
JU6		X

NOTES

1. Capacitor values are in microfarads, inductor values are in microhennies
2. Optional field connection of shield to chassis
3. Connections are shown for negative ground. For positive ground, reverse the polarity of C1, C2, CR1 and CR2, and arrange jumpers as indicated in the table above. Positive ground is an option for MCT1200/Metrocom II only
4. Green wire connects to vehicle chassis (via screw in mounting tray) and is routed to and terminated at logic unit housing top (chassis). This connection provides anti-static discharge protection for the logic unit
5. TRN8801A Buzzer is optional for MCT1200/Metrocom II only
6. Hookswitch is optional for Metrocom Plus only. Hookswitch is part of TLN5843A Handset Hang-Up Switch Box
7. This connection is normally a spare, except for Metrocom Plus with hookswitch option
8. TKN8128A Radio Cable is part of the positive ground option for MCT1200 Metrocom II only.
9. For positive ground installations using Mitrek radios with TKN8243A, jumpers JU2, JU4 and JU5 are in, and JU1, JU3 and JU6 are out

Mobile Data Terminal Interconnect Cabling Diagrams, Filter Board Schematic Diagram and Circuit Board Detail, and Parts Lists
Motorola No. PEPS-32713-B (Sheet 3 of 3)
5/25/83-PHI



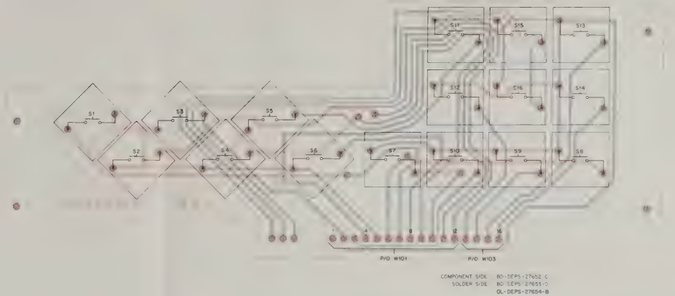
SHOWN FROM COMPONENT SIDE

SOLDER SIDE = 80-EEPS-27644-D
COMPONENT SIDE = 80-EEPS-27645-D
OL-EEPS-27646-E

MPU BOARD

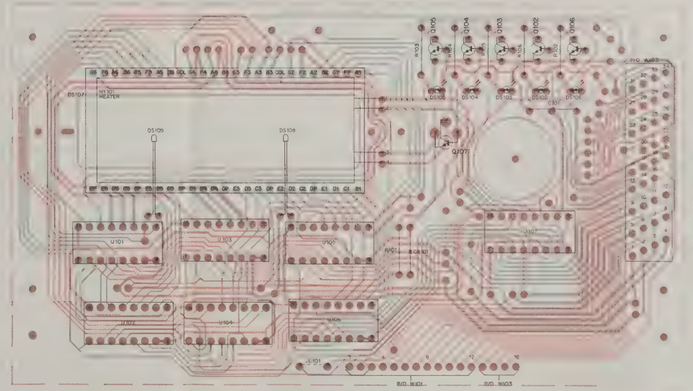
Mobile Data Terminal
Schematic Diagram, Circuit Board Details,
Waveforms, and Parts Lists
Motorola No. ***PEPS-27741-E***
(Sheet 1 of 4)
5/25/83-PHI

SWITCH BOARD



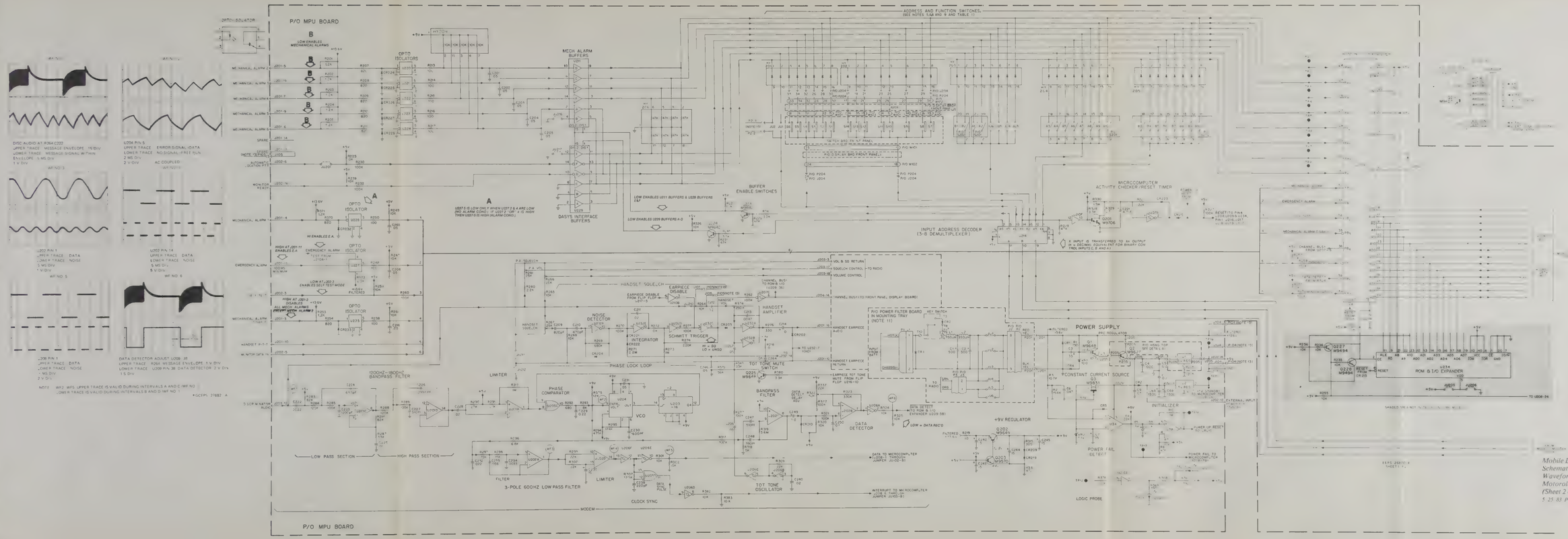
SHOWN FROM COMPONENT SIDE

DISPLAY BOARD



SHOWN FROM COMPONENT SIDE

NOTE:
THE TRN8713A DISPLAY AND SWITCH BOARDS WITH OPTIONAL SWITCHES, S9-S16, AND RIBBON CABLE, W103, ADDED ARE SHOWN. REFER TO THE MOBILE DATA TERMINAL SCHEMATIC DIAGRAM FOR DETAILS ON W103 AND S9-S14 (S15 AND S16 ARE FOR FUTURE APPLICATIONS.) THE TRN8718A DISPLAY AND SWITCH BOARDS ARE SIMILAR EXCEPT FOR COMPONENT DELETION. REFER TO THE PARTS LIST FOR DETAILS.



Mobile Data Terminal
Schematic Diagram, Circuit Board Details, Waveforms, and Parts Lists
Motorola No. PEPS-27741-E
(Sheet 2 of 4)
5 23 83 PH1

parts list

TRN8715A MPU Board (8 Alarms) PL-6356-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: ±F + 80-20%; 25 V; unless otherwise stated
C5	23-82783B01	33 +- 20% .25 V
C4	23-83210A24	1000 + 150-10%; 25 V
C5	21-82372C05	0.2
C6A B	28-84665F17	1500 + 100-10%, 16 V
C7	23-865136	15 +- 20%, 25 V
C8	8-82905G03	.047 +- 10%; 50 V
C9	21-82372C04	.05
C10	23-82783B10	1.0 +- 20%; 50 V
C11	21-82372C05	0.2
C201 thru 208	21-82372C04	.05
C209	21-82633E08	500 pF +- 5%; 100 V
C210	21-84494B19	470 pF +- 5%; 300 V
C211	8-82905G23	.02 +- 10%, 100 V
C212	21-82372C05	0.2
C213	8-82905G26	.0047 +- 10%; 100 V
C214	23-82783B10	1.0 +- 20%; 50V
C215		NOT USED
C216	21-82372C04	.05
C217 218	21-82133G46	24 pF +- 5%, 500 V
C219	23-84906L01	2.2 +- 20%; 50 V
C220		NOT USED
C221	23-865137	4.7 +- 20%; 25 V
C222	8-84496D06	.0022 +- 10%, 630 V
C223	21-84857K02	1200 pF +- 5%, 500 V*
C224	21-84494B21	650 pF +-5%, 300 V
C225	8-82905G01	.01 +- 10%, 50 V
C226	21-84494B54	2000 pF +- 5%, 500 V
C227	21-84494B20	510 pF +- 5%, 300 V
C228	8-82905G23	.02 +- 10%, 100 V
C229	8-82905G11	.22 +- 10%, 50 V
C230	21-84857K10	1600 pF +- 1%, 100 V
C231	21-82372C04	.05
C232	8-82905G02	.022 +- 10%, 50 V
C233	8-82095G16	.056 +- 5%, 200 V
C234	8-82905G25	.0033 +- 10%; 100 V
C235	23-865136	15 +- 20%, 25 V
C236	21-82372C04	.05
C237	21-84857K29	250 pF +- 5%, 500 V
C238	21-84494B30	34 pF +- 5%, 500 V
C239	21-84857K17	220 pF +- 3%, 100 V
C240	8-82905G23	.02 +- 10%, 100 V
C241		NOT USED
C242	23-83210A21	15 +- 150-10%; 25 V
C243 244 245	23-865136	15 +- 20%, 25 V
C246	21-82372C04	.05
C247	21-84494B20	510 pF +- 5%, 300 V
C248	21-84494B81	390 pF +- 3%, 300 V
C249	23-82783B10	1 +- 20%, 50 V
C250	21-82372C01	0.1
C251	8-82905G03	.047 +- 10%; 50 V
C252	8-84496D06	.0022 +- 10%; 630 V
C253	8-82905G11	0.22 +- 10%; 50 V
C254	23-82783B31	47 +- 20%; 20 V
C255 256	21-82372C04	.05
C266	21-84857K29	250 pF +- 5%; 500 V
C267 268		NOT USED
C269	23-82783B10	1 +- 20%, 50 V
		diode: (see note)
CR1	48-82525G02	silicon
CR2	48-82466H13	silicon
CR3, 4	48-83654H01	silicon
CR200, 201		NOT USED
CR202	48-82178A01	germanium
CR203	48-83654H01	silicon
CR204	48-84616A01	hot carrier
CR205 thru 214	48-83654H01	silicon
CR215	48-82178A01	germanium
CR216 217 218		NOT USED
CR219 thru 229	48-83654H01	silicon
CR230		NOT USED
CR231 232 233	48-83654H01	silicon
		light emitting diode:
DS201 202	48-84404E02	red
		relay:
K201	80-82617M10	1 form "C" coil res 500
K202	80-82617M01	1 form "A" coil res 820
L3	24-83961B03	choke, rf
		hybrid, assembly:
HY201 thru 205	1-80710D19	diode network
HY206	1-80712D84	resistor network (47k)
HY207	1-80712D85	resistor network (10k)
HY208	1-80712D84	resistor network (47k)
HY209	1-80712D85	resistor network (10k)
		connector:
J104	28-84526K13	receptacle, male; 10 pin; 2 used
J201 202 203	29-84547B03	pins; 60 used
J204	28-84528K12	receptacle, male; 34 pin
J205	28-84528K13	receptacle, male; 10 pin; 2 used
		transistor: (see note)
Q1	48-869648	NPN, type M9648
Q3	48-869831	field effect, type M9831

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q201	48-869706	NPN; type M9706
Q202	48-869649	PNP; type M9649
Q203	48-869570	NPN; type M9570
Q204	48-869648	NPN; type M9648
Q205	48-869706	NPN; type M9706
Q206	48-899712	Darlington type M9712
Q207 thru 209	48-869642	NPN; type M9642
Q210 thru 222	48-869648	NPN; type M9648
Q223, 224	48-869642	NPN; type M9642
Q225, 226	48-869648	NPN; type M9648
Q227 thru 230		NOT USED
Q231, 232	48-869706	NPN; type M9706
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	8-126C29	150 +- 10%; 1 W
R2	8-84640C84	15.4k +- 0.5%
R3	8-84640C63	10.74k +- 0.5%
R4	8-124A81	22k
R5, 6	8-124A77	15k
R7	8-124A75	12k
R8	8-124A49	1k
R9		NOT USED
R10	8-124B22	1 meg
R101		NOT USED
R201 thru 205	8-125A51	1.2k, 1/2 W
R206		NOT USED
R207 thru 211	8-125A47	820, 1/2 W
R212		NOT USED
R213 thru 217	8-124A35	100
R218, 219	8-124A01	10
R220	8-124A73	10k
R221	8-124A81	22k
R222 thru 224		NOT USED
R225	8-124A83	33k
R226, 227		NOT USED
R228, 229	8-124A89	47k
R230	8-124A97	100k
R231	8-124A89	47k
R232	8-124A97	100k
R233	8-124A73	10k
R234	8-124A68	910
R235, 236		NOT USED
R237	8-124A48	910
R238		NOT USED
R239	8-124A73	10k
R240, 241	8-124A61	3.3k
R242, 243		NOT USED
R244, 245	8-124A61	3.3k
R246		NOT USED
R247	8-124A73	10k
R248	8-124A25	100
R249	8-124A73	10k
R250	8-124A25	100
R251	8-124A73	10k
R252	8-124A97	100k
R253	8-125A51	1.2k, 1/2 W
R254	8-125A47	820, 1/2 W
R255 thru 257	8-124A73	10k
R258	8-124A97	100k
R259	8-124A73	10k
R260	8-124A97	100k
R261	8-124A73	10k
R262	8-124A97	100k
R263, 264		NOT USED
R264, 265	8-124A73	10k
R266, 267	18-84944C02	variable, 25k
R268	8-124A73	10k
R269	8-124B18	680k
R270	8-124A97	100k
R271	8-124B30	2.2 meg
R272	8-124A73	10k
R273	8-124B22	1 meg
R274	8-124B08	220k
R275	8-124A97	100k
R276	8-124A37	330
R277	8-124A97	100k
R278		NOT USED
R279	18-84944C12	variable, 5k
R280	8-124A57	2.2k
R281	18-84944C02	variable, 25k
R282, 283		NOT USED
R284	8-124A99	120k
R285		NOT USED
R286	8-124A85	82k
R287	8-124A85	33k
R288, 289	8-124A99	120k
R290, 291	8-124A83	27k
R292	8-124A45	680
R293	8-124A55	1.8k
R294	8-83175C97	4.75k ± 1%
R295	8-83175C92	17.4k ± 1%
R296	8-124A69	6.8k
R297	8-124A73	10k
R298	8-124A77	15k
R299, 300	8-124A81	22k
R301, 302	8-124A73	10k
R303, 304	8-124B22	1 meg
R305	8-124B14	470k
R306	8-124A43	560

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R307	8-124A99	120k
R308 thru 312		NOT USED
R313	8-124B22	1 meg
R314		NOT USED
R315	8-124A36	300
R316	8-124A41	470
R317	8-124B10	330k
R318	8-124A77	15k
R319	8-124B40	5.6 meg
R320	8-124A73	10k
R321	8-124A97	100k
R322	18-84944C13	variable; 50k
R323	8-124B10	330k
R324, 325, 326	8-124A73	10k
R327	8-124A97	100k
R328	8-124A61	3.3k
R329	8-124B55	2.7
R330	8-124B28	1.8 meg
R331	8-124A73	10k
R332	8-124A87	5.6k
R333	8-124A61	3.3k
R334	8-124B22	1 meg
R335	8-124A97	100k
R336	8-124A77	15k
R337	8-124A81	22k
R338		NOT USED
R339	85-124A95	82k
R340, 341, 342	8-124A81	820, 1/2 W 3.3k
R343	8-124A85	33k
R344	8-124A61	3.3k
R345, 346		NOT USED
R347	8-124A67	5.6k
R348 thru 359	8-124A61	3.3k
R360 thru 363		NOT USED
R364	8-124A83	33k
R365, 366		NOT USED
R369	8-124A39	390
R368	8-124A35	270
R369	8-124A39	390
R370	8-125A47	820, 1/2 W
R371	8-125A51	1.2k, 1/2 W
R372	8-124A63	3.9k
R373	8-124A56	2.0k
R374	18-83944C05	variable, 250k
R375	8-124A75	12k
R376		NOT USED
R377 378	8-124A97	100k
R379	8-124A91	56k
R380	8-124A61	3.3k
R381		NOT USED
R382 383	8-124A73	10k
R384	8-124A81	22k
		switch:
S201, 202	40-83022M01	10 position, spst
		integrated circuit: (see note)
U2	51-84371K56	type LM309
U3	51-84371K59	type LM339
U201 202	51-84371K57	type LM348
U203	51-84561L88	type 74C93
U204	51-84561L23	type 555
U205	51-84561L94	type 74C86
U206, 207	51-84561L93	type 74C14 see Firmware Kit
U208, 209		
U210	51-84561L97	type 74C906
U211	51-84561L90	type 80C95
U212, 213		NOT USED
U214, 215	51-82884L45	type 4051
U216 thru 219	51-84561L92	type 74C174
U220 thru 224	51-83629M98	type 4N36
U225, 226		NOT USED
U227, 228	51-83629M98	type 4N36
U229	51-84561L96	type 80C97 NOT USED
U230, 231		
U232	51-82609M01	type 74C04 100k
U233, 234		
U235	51-83629M98	type 4N36
		voltage regulator: (see note)
VR1	48-82256C67	Zener type; 10 V
VR2	48-82256C15	Zener type; 5.1 V
VR201	48-83461E45	Zener type; 25 V
Y201	48-82611M07	**crystal, microprocessor:** 5.76 MHz
		mechanical parts
	42-82919H01	CLIP, component mounting
	14-861196	INSULATOR, transistor
	14-84891E01	INSULATOR, stand-off (PB switch)
	43-82768M01	SPACER
	61-82390M01	LENS, led
	3-1960	SCREW, 2-56 x 3/8"; 2 used
	3-134184	SCREW, machine; 4-40 x 5/16"; 4 used
	61-82390M03	LENS, led
	13-82387M02	ESCUTCHEON
	9-84181L01	SOCKET, 2-contact
	42-83553G01	STRAP, tie

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-135843	SCREW, machine; 6-32 x 5/16"
	2-7002	NUT, 6-32
	47-84282D01	BEING PIN, male; 50 used
	14-84891E01	SPACER, crystal
	14-861196	INSULATOR, transistor
	4-1725	WASHER, flat; 2 used
	9-82601M01	IC SOCKET, microprocessor; 40 pin

NOTE: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN8721 Firmware Kit PL-6366-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		integrated circuit: (see note)
U208	51-82609M13	type 8048
U209	51-82609M14	type 8355

TRN8713A Display and Switch Boards PL-6361-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C101	21-84448K03	0.1 uF + 80-20%; 50 V
		light emitting diode: (see note)
DS102 thru 106	48-88245C20	red
		transistor: (see note)
Q102 thru 106	48-869642	NPN; type M9642
Q107	48-869806	NPN; type M9806
		resistor, fixed:
R102 thru 106	6-124A43	560 ± 5%; 1/4 W
R107	6-124A35	270 ± 5%; 1/4 W
		switch:
S1 thru 8	40-82765M01	momentary, spst
		integrated circuit: (see note)
U101 thru 106	51-82684L50	type M54L50
U107	51-84561L92	type M61L92
		voltage regulator:
VR101	48-82256C51	Zener type; 5.1 V; 1 W
		cable:
W101	30-82649M01	flat w/connector; 12-conductor
W102	30-82850M01	flat w/connector; 34-conductor
W103	30-82849M02	flat w/connector; 4-conductor (option D335AA only)
		mechanical parts
	4-858060	WASHER, insulator; 5 used
	14-83684K02	INSULATOR

TRN8718A Display and Switchboards PL-6481-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C101	21-84448K03	.1 uF + 80-20%, 50 V
		light emitting diode: (see note)
DS102	48-88245C20	red
DS103		NOT USED
DS104 thru 106	48-88245C20	red
		transistor: (see note)
Q102, 104, 105, 106	48-869642	NPN; type M9642
Q107		NOT USED
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R102, 103, 104	6-124A43	560
R105		NOT USED
R106	6-124A43	560
R107		NOT USED
		switch:
S7, 8	40-82765M01	momentary, spst
		integrated circuit: (see note)
U107	51-84561L92	type 74C174
		cable:
W101	30-82649M01	flat w/connector; 12-conductor
W102	30-82850M01	flat w/connector; 34-conductor

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers only.

TRN5382A & TRN6390A Housing Top PL-6368-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
LS201	50-82225L01	**speaker:** 8 ohms dia. 1.57"
Q2	48-869627	**transistor: (see note)** NPN; type M9627
U1	51-82609M15	**integrated circuit: (see note)** type 0M15
P205		**connector, receptacle:** includes housing, connector; 10-contact female; 8 contacts pin, polarizing
		mechanical parts
	3-134268	SCREW, tapping; 4-40 x 7/16"; 2 used
	3-136253	SCREW, machine; 6-32 x 5/8"; 4 used
	9-82673A01	SOCKET, transistor; 2 used
	13-82636M01	GRILLE, speaker
	14-865854	INSULATOR, transistor; 2 used
	15-82827M01	HOUSING, top (TRN5382A)
	32-82768M03	GASKET
	32-84013G02	GASKET, speaker
	42-82688M01	CLIP, speaker; 2 used
	42-83129A16	SCREW, 2-56 x 3/16"
	15-83287M03	HOUSING, top (TRN6390A)
	32-82817N01	GASKET, 2 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers only.

TRN8714A Front Panel Hardware PL-6363-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		lamp, miniature:
DS101, 109	65-83479E03	12 V; clear; type 7219
DS107	72-82008M02	liquid crystal display
		hybrid:
HY101	1-80712D89	LCD heater; includes RT101
RT101	6-84348L02	thermistor, 20 @25°C
		mechanical parts
	2-7041	NUT, 2-56 x 3/16 x 1/16"; 2 used
	3-1523	SCREW, machine; 2-56 x 7/16"; 2 used
	4-8406	WASHER, lock #2 internal; 2 used
	7-82690N01	PANEL
	13-82331M01	BEZEL
	28-82028M02	CONNECTOR; 2 used
	28-82778M01	CONNECTOR; plug
	32-82165M03	GASKET, LED, housing; 2 used
	42-82330M01	RETAINER
	61-82814N01	LENS, LCD

TRN8719A Front Panel Hardware Kit PL-6482-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	7-82690N01	PANEL
	5-82781M01	RIVET, nylon; 2 used
	28-82778M01	CONNECTOR, plug

TRN5135A Remote Entry Of ID PL-8523-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		integrated circuit: (see note)
U208	51-82848M09	type 8748
U209	51-82848M10	type 8755

note: In order to receive a properly programmed IC, these parts must be ordered as a kit or as part of the specified kit.

Mobile Data Terminal
Schematic Diagram, Circuit Board Details, Waveforms, and Parts Lists
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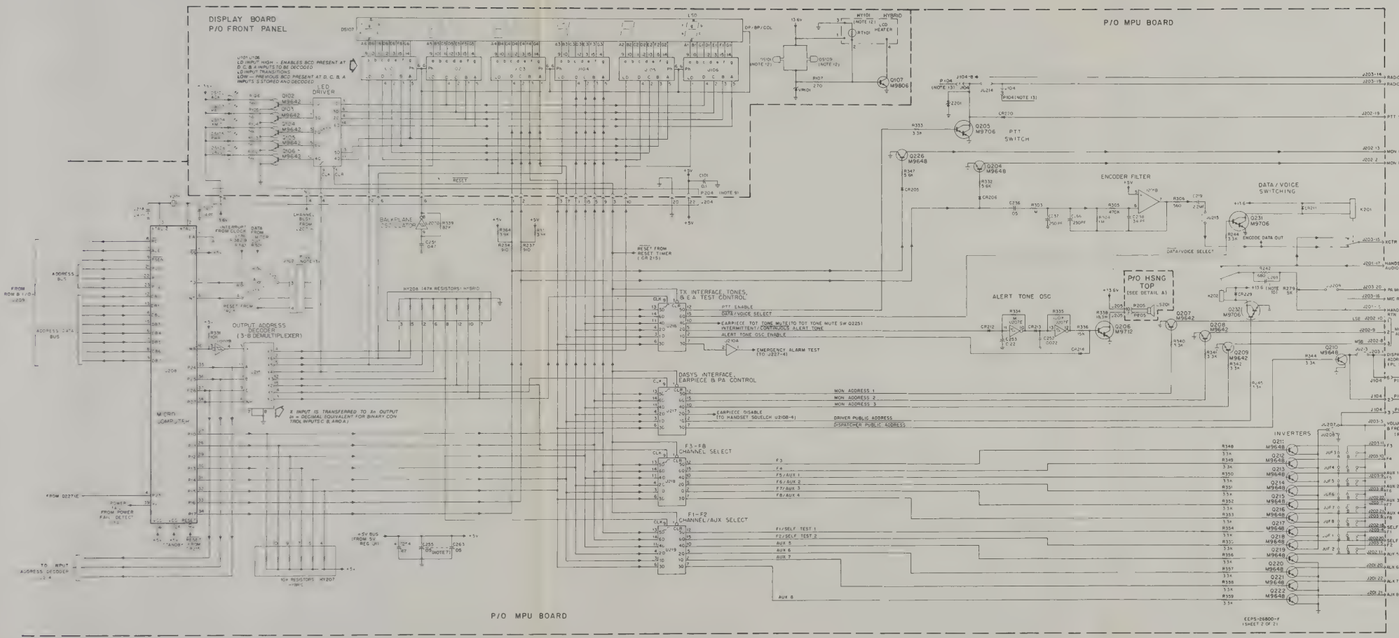

NOTES

1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in microfarads.
2. This diagram uses positive logic. Defined logic levels are as follows:

   High (1) logic level greater than 3.5 volts
   Low (0) logic level less than 1.5 volts
3. Some integrated circuits on this board are CMOS devices.
4. Integrated circuits power/ground connections are as follows:

Reference Designation	Type	+5V	Gnd	Mfg'rs Description	+9V
U1	LM309			5 V reg	
U2	LM309			5 V reg	
U3	LM339			Comparator	
U101, 102, 103, 104, 105, 106	4543	16	7,8,8	LCD driver	
U107, 216, 217, 218, 219	74C174	16	8	Hex D Flip-Flop	
U201, 202	LM348	—	1	Quad. Amplf	4
U203	74C93	—	11	Counter	4
U204	NE555	—	1	Timer	8
U205	74C86	—	7	Excl. Or	14
U206, 207	74C14	14 (U207)	7	Schmitt Trig.	14 (U206)
U208 (Note 14)	8048/8748	40	20	Microcomputer	
U209 (Note 14)	8355/8755	40	20	Rom & I/O Expander	
U210	74C906	14	7	Hex Buffer	
U211	80C95	16	8	Hex 3-State Buffer	
U214, 215	4051	16	7,8	3-8 Analog Mux	
U220, 221, 222, 223, 224, 227, 228, 235	Note 15	—	2, 4	Opto-Isolator	
U229	80C97	16	8	Hex 3-State Buffer	
U232	74C04	—	7	Hex Inverter	14

5. MPU board jumper connections and usage are as follows:

Jumper	Function
JUF1 Thru JUF8	For remote frequency switching, pins A and B should be connected by jumpers corresponding to all the frequencies to be used. All other jumpers should be out. For fixed frequency selection, pins B and C should be connected by one jumper corresponding to the frequency to be used. Only one frequency may be used! All other jumpers should be out.
JU1	Spare
JU2	Number of group call comparison VID digits — In for two most significant digits; out for three most significant digits
JU3	Data channel keyup delay — In for 100 Millisecond delay; out for 50 Millisecond delay
JU4	Voice channel keyup delay — In for 425 Millisecond delay; out for 250 millisecond delay
JU5	Number of remote selectable Frequencies — In for 8 frequencies; out for 4 frequencies
JU6	Spare
JU101	(Located on display board) driver P.A. enable — In for enable, out for disable
JU102 & JU103	Jumpers normally connect point A to point B. For self-test manual mode, connect point A to point C.
JU201	Location PTT — No effect except when data terminal is used with optional vehicle location processing unit, then jumper must be in.
JU202	In when using 8755A EPROM at U209; Out when using 8355 ROM at U209
JU204	Memory capacity — In for 3K-BYTE (normal condition if U234 is not used); out for 4K-BYTE (when U234 is used)
JU205 & JU206	Added memory (U234) enable — for enable, JU205 In and JU206 out; for disable, JU205 out and JU206 in. (Both jumpers must never be in at the same time!)
JU207 & JU208	Remote frequency selection — for negative ground, JU207 in and JU208 out. For positive ground, JU207 out and JU208 in.
JU209	Driver P.A. — In enables; out disables.
JU210	earpiece audio — In for negative ground; for positive ground option, remove JU210 and R264 and insert R264 in JU210 position.
JU211 & JU212	Earpiece audio return — for negative ground JU211 in and JU212 out; for positive ground option JU211 out and JU212 in.
JU213	Dispatcher P.A. — In for negative ground; out for positive ground option.
JU214	Radio PTT — In for negative ground; out for positive ground option
JU215	Encode data output — In for encode data output; out for no encode data output.
JU216	Mechanical alarm 7 enable — In for disable; out for enable
JU217	Mechanical alarm 8 enable — In for disable; out for enable

6. Switches S1 through S14 are pushbutton switches mounted On the front panel.
7. C255 through C264 are .05 uF bypass capacitors which are connected to the +5 V bus adjacent to the various integrated circuits.
8. W101 is 12-conductor gray ribbon cable. W103 is 4-conductor gray ribbon cable and is used only with option D335AA Message capability.
9. P204 connects MPU board to display board via 34-conductor ribbon cable (W102).
10. C269 used with Micor* radios. R242 Replaces C269 in MOCOM+70* radios.
11. Connections are shown for negative ground. For positive ground, reverse the polarity of C1, C2, and CR1 remove JU1, JU3, and JU5, and insert JU2, JU4, and JU6. Refer to Interconnect cabling diagram for further circuit details on filter board.
12. HY101, DS101, and DS102 are part of TRN8714A Front Panel Hardware Kit.

Table 1. Address and Function Switches

Switch No	Function
S1 thru S6	Controls U101 thru U106 Respectively
S7	Request to talk
S8	Priority request to talk
S9	Option D335AA message capability
S10	Driver public address
S11 thru S14	Option D335AA message capability
S201-A1 thru A16	Fixed ID entry
S202-B1 thru B16	Fixed ID entry

13. P2, P102, P104, and P105 are used only for Special applications.
14. U208 and U209 are part of the microprocessor kit.
15. The opto-isolator is a special version of 4N36.

DO NOT DISCARD THE EXISTING PAGE IN YOUR MANUAL. THE DIAGRAMS AND PARTS LISTS ON THE REVERSE SIDE ARE STILL APPLICABLE.

Mobile Data Terminal
Schematic Diagram, Circuit Board Details, Waveforms, and Parts Lists
Motorola No. PEPS-27741-E
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FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMR's are added to the manuals as the engineering changes are incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

As diagrams are updated, information about the change is incorporated into a revision column. This revision column appears in the manual next to the parts list or, in some cases, on the diagram. It lists the reference number, part number, and description of the parts removed or replaced.

3. SERVICE

Depot service and support services are available through the Motorola Data Service Organization. Should you desire these services for your equipment, contact:

Data Service Organization
Motorola Communications and Electronics, Inc.
1303 E. Algonquin Road
Schaumburg, Illinois 60196

4. REPLACEMENT PARTS ORDERING

Motorola maintains a number of parts offices strategically-located throughout the United States. These facilities are staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Communications Group products.

Orders for all parts *except* crystals, active filters, code plugs, channel elements, and "Vibrasender" ® and "Vibrasponder" ® resonant reeds should be sent to the nearest area parts center. Orders for instruction manuals should also be sent to the area parts center.

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Orders for crystals, channel elements, active filters, PROMs, code plugs, and reeds should be sent directly to the factory address listed on the following page. Crystal and channel element orders should specify the crystal or channel element type number, crystal and carrier frequency, and the chassis model number in which the part is used.

Orders for active filters, PROMs, code plugs, *Vibrasender* and *Vibrasponder* resonant reeds should specify type number and frequency, should identify the owner/operator of the communications system in which these items are to be used; and should include any serial numbers stamped on the components being replaced.

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA Communications and
Electronics Inc.
Communications & Electronics Parts
1313 E. Algonquin Rd.,
Schaumburg, Illinois 60196
Phone: 312-576-3900

5.2 U.S. ORDERS

WESTERN AREA PARTS
1170 Chess Drive, Foster City,
San Mateo, California 94404
Phone: 415-349-3111
TWX: 910-375-3877

MIDWEST AREA PARTS
1313 E. Algonquin Road
Schaumburg, Ill. 60196
Phone: 312-576-7430
TWX: 910-693-0869

MID-ATLANTIC AREA PARTS
7230 Parkway Drive
Hanover, Maryland 20176
Phone: 301-796-8763
TWX: 710-862-1941

EAST CENTRAL AREA PARTS
12995 Snow Road,
Parma, Ohio 44130
Phone: 216-433-1560
TWX: 810-421-8845

EASTERN AREA PARTS
85 Harristown Road,
Glen Rock, New Jersey 07452
Phone: 201-444-9662
TWX: 710-988-5602

PACIFIC SOUTHWESTERN AREA PARTS
P.O. Box 85036
San Diego, California 92138
Phone: 714-578-8030
TWX: 910-335-1516

GULF STATES AREA PARTS
1140 Cypress Station
P.O. Box 73115
Houston, Texas 77090
Phone: 713-537-3636
TWX: 910-881-6392

SOUTHWESTERN AREA PARTS
P.O. Box 34290
3320 Belt Line Road,
Dallas, Texas 75234
Phone: 214-620-8511
TWX: 910-860-5505

SOUTHEASTERN AREA PARTS
P.O. Box 368
Decatur, Georgia 30031
Phone: 504-987-2232
TWX: 810-766-0876

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MOTOROLA LTD.
National Parts Department
3125 Steeles Avenue East
Willowdale, Ontario M2H 2H6
Phone: 416-499-1441
TWX: 610-491-1032
Telex: 06-526258

5.4 ALL COUNTRIES EXCEPT U.S. AND CANADA

MOTOROLA, INC.
International Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.
Phone: 312-576-6492
TWX: 910-693-0869
Telex: 722443
Cable: MOTOL PARTS

5.5 FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, ACTIVE FILTER, CODE PLUGS, PROMs, AND RESONANT REED ORDERS

ALL MAIL ORDERS
Motorola, Inc.
Component Products Sales & Service
P.O. Box 66191
O'Hare International Airport
Chicago, Ill. 60666

CORRESPONDENCE
Motorola, Inc.
Component Products Sales & Service
2553 N. Edgington Street
Franklin Park, Illinois 60131
Phone: 312-451-1297
TWX: 910-227-0799
Telex: 433-0067

PERFORMANCE SPECIFICATIONS

GENERAL

Size	6.8" W (17.3cm) x 5"H (12.7cm) x 13.5"D (34.3cm) including mounting assembly (automobile trunnion mount available).
Weight	9.5 pounds (4.3 kg) including mounting assembly.
Temperature	−30°C to +60°C (−22°F to +140°F)
Voltage	13.8 volt dc ±20% negative or positive (adapter) ground (floating ground possible).
Humidity	95% RH
Shock	Meets EIA RS152B requirements
Vibration	Meets EIA RS152B requirements
Current Drain	Nominally 0.5 A at 13.8 V dc room temperature

MODEL T1941

Controls	Internal squelch and handset volume controls (separate internal volume control for optional speakers). Remote control selection of up to eight frequencies. Address Programming: — Internal, five digit (0-9) — Front panel, six digit (0-9) switch controlled Armored cable handset with PTT switch.
Switches	Request-To-Talk Priority Request-To-Talk Key On/Off Emergency Alarm — Separate from mobile data terminal Mechanical Alarms — 6 standard Driver Public Address (optional) Variable ID Input — 6 switches
Indicators	High Intensity LED: Power On (PWR) Transmit (TX) Call (CALL) Acknowledge (ACK) Driver Public Address (PA) (option) Audible: Individual Call — 5-second interrupted tone Group and All Call — 5-second continuous tone Front panel switch activation has tone response. Six digit liquid crystal display for variable (route/run) ID (back lighted for night visibility)

MODEL T1940

Controls	Internal squelch and handset volume controls. Remote control selection of up to eight frequencies. Address Programming — Internal, five digit (0-9) Armored cable handset with PTT switch.
Switches	Request-To-Talk Priority Request-to-Talk Key On/Off Emergency Alarm — Separate from mobile data terminal Mechanical Alarms — 6 standard
Indicators	High Intensity LED: Power On (PWR) Transmit (TX) Call (CALL) Acknowledge (ACK) Audible: Individual Call — 5 second interrupted tone Group and All Call — 5 second continuous tone

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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MODEL CHART

FOR

MCT-1200 AND *METROCOM II*

MOBILE COMMUNICATIONS TERMINAL

(CURRENT MODELS)

CODE:

● = QUANTITY OF ONE SUPPLIED

/ = QUANTITY OF ONE PER 20 UNITS

MODEL	T1940C	T1941C	T1964B	ITEM	DESCRIPTION
DESCRIPTION	MOBILE DATA TERMINAL w/o LCD	MOBILE DATA TERMIAL w/LCD	MOBILE DATA TERMINAL ACCESSORIES		
	●	●		THN6382A	TOP HOUSING KIT
	●			TLN2020A	FRONT PANEL KIT (w/o LCD)
	●			TRN8718A	DISPLAY AND SWITCHBOARD
	●			TRN8719A	FRONT PANEL HARDWARE
		●		TLN2019A	FRONT PANEL (w/LCD)
		●		TRN8713A	DISPLAY AND SWITCHBOARD
		●		TRN8714A	FRONT PANEL HARDWARE
	●	●	●	TMN6143A	HANDSET (ARMORED CABLE)
	●	●	●	TRN4471A	FILTER BOARD
	●	●	●	TRN4468A	TRAY HARDWARE
	●	●		TRN8715A	MPU BOARD
	●	●		TRN8720A	HARDWARE AND HOUSING
	●	●		TRN8721A	MICROCOMPUTER AND ROM WITH I/O
		●		TRN5530A	ESCUTCHEON (STD w/LCD)
	●			TRN5529A	ESCUTCHEON (STD w/o LCD)
	●	●	●	TRN8777A	HANG-UP CLIP
	●	●	●	TRN8793A	INSTALLATION HARDWARE
	●	●	●	TKN6458A	CABLE AND FUSE KIT
	●	●	●	TKN8127A	RADIO CABLE KIT (20 FT.)
	●	●	●	TKN8130A	CABLE, ALARM
	●	●	●	TKN8126A	CABLE, POWER
	/	/	/	TRN8794A	GENERAL TOOL KIT
	●	●	●	TRN4473A	LOCK KIT (KEY NUMBER 2135)
	●	●	●	TRN4474A	LOCKSWITCH KIT (KEY NUMBER 2135)

EPS-35751-O

MODEL CHART
FOR
MCT-1200 AND *METROCOM II*
MOBILE COMMUNICATIONS TERMINAL
(EARLIER MODELS, B SUFFIX)

CODE:

● = QUANTITY OF ONE SUPPLIED

/ = QUANTITY OF ONE PER 20 UNITS

T1940B	T1941B	T1964B	ITEM	DESCRIPTION
	MODEL	DESCRIPTION		
	MOBILE DATA TERMINAL w/o LCD			
	MOBILE DATA TERMIAL w/LCD			
	MOBILE DATA TERMINAL ACCESSORIES			
●	●		THN6382A	TOP HOUSING KIT
●			TLN2020A	FRONT PANEL KIT (w/o LCD)
●			TRN8718A	DISPLAY AND SWITCHBOARD
	●		TRN8719A	FRONT PANEL HARDWARE
	●		TLN2019A	FRONT PANEL (w/LCD)
	●		TRN8713A	DISPLAY AND SWITCHBOARD
●	●	●	TRN8714A	FRONT PANEL HARDWARE
●	●	●	TMN6143A	HANDSET (ARMORED CABLE)
●	●	●	TRN4471A	FILTER BOARD
●	●		TRN4468A	TRAY HARDWARE
●			TRN8715A	MPU BOARD
●	●		TRN8720A	HARDWARE AND HOUSING
●	●		TRN8721A	MICROCOMPUTER AND ROM WITH I/O
	●		TRN8775A	ESCUTCHEON (STD w/LCD)
●			TRN8792A	ESCUTCHEON (STD w/o LCD)
●	●	●	TRN8777A	HANG-UP CLIP
●	●	●	TRN8793A	INSTALLATION HARDWARE
●	●	●	TKN6458A	CABLE AND FUSE KIT
●	●	●	TKN8127A	RADIO CABLE KIT (20 FT.)
●	●	●	TKN8130A	CABLE, ALARM
●	●	●	TKN8126A	CABLE, POWER
/	/		TRN8794A	GENERAL TOOL KIT
●	●	●	TRN4473A	LOCK KIT (KEY NUMBER 2135)
●	●	●	TRN4474A	LOCKSWITCH KIT (KEY NUMBER 2135)

EPS-32715-B

MODEL CHART

FOR

METROCOM II DATA UNIT

(EARLIER MODELS, A SUFFIX)

CODE:

● = QUANTITY OF ONE SUPPLIED

/ = QUANTITY OF ONE PER 20 UNITS

MODEL DESCRIPTION	T1940A *METROCOM II* w/o LCD	T1941A *METROCOM II* w/LCD	ITEM	DESCRIPTION
	●	●	THN6382A	TOP HOUSING KIT
	●		TLN2020A	FRONT PANEL KIT (w/o LCD)
	●		TRN8718A	DISPLAY AND SWITCHBOARD
	●		TRN8719A	FRONT PANEL HARDWARE
		●	TLN2019A	FRONT PANEL (w/LCD)
		●	TRN8713A	DISPLAY AND SWITCHBOARD
		●	TRN8714A	FRONT PANEL HARDWARE
	●	●	TLN2132A	MOUNTING TRAY
	●	●	TMN6143A	HANDSET (ARMORED CABLE)
	●	●	TRN8795A	FILTER BOARD
	●	●	TRN8796A	TRAY HARDWARE
	●	●	TRN8715A	MPU BOARD
	●	●	TRN8720A	HARDWARE AND HOUSING
	●	●	TRN8721A	MICROCOMPUTER AND ROM WITH I/O
		●	TRN8775A	ESCUTCHEON (STD w/LCD)
	●		TRN8792A	ESCUTCHEON (STD w/o LCD)
	●	●	TRN8777A	HANG-UP CLIP
	●	●	TRN8793A	INSTALLATION HARDWARE
	●	●	TKN6458A	CABLE AND FUSE KIT
	●	●	TKN8032A	RADIO CABLE KIT (20 FT.)
	●	●	TKN8038A	CABLE, ALARM
	●	●	TKN8039A	CABLE, POWER
	/	/	TRN8794A	GENERAL TOOL KIT

EPS-27614-B

OPTION CHART

Model	Kit Added	Kit Omitted	Description
		D321AB Mounting Tray with Coil Cord	
T1940 T1941 T1964	TMN6144A TRN4469A	TRN4468A TMN6143A	Changes armored handset cord to a coil cord with quick-disconnect plug.
		D121AC Micor Radio Positive Ground	
T1940 T1941	TKN8128A TKN8077A TRN4239A TRN4240A TRN4472A	TKN8127A TRN4471A	Allows connection to a positive ground radio.
		D322AB Special Mounting Tray	
T1940 T1941 T1964	TRN4470A	TRN4468A	Changes standard mounting tray to one which provides mounting facilities for an accessory mounting bracket.
		D323AA Buzzer	
T1940 T1941 T1964	TRN8801A	N/A	Provides audio alert determined by system requirement; e.g. start-of-run.
		D324AB Mocom Radio Cable	
T1940 T1941 T1964	TKN8129A	TKN8127A	Allows connection to negative ground *Mocom* Radio set.
		D130AC 8-Frequency Remote Switching	
T1940 T1941	TRN4247A	N/A	Changes model from 4-frequency remote switching to 8-frequency remote switching.
		D327AA Driver PA	
T1941	N/A	N/A	Allows vehicle driver to make announcements to passengers.
		D330AA Inverted Control Panel	
T1940 T1941	N/A	N/A	Inverts the control panel.
		D332AA Group Call Mode	
T1941	TRN4279A	N/A	Changes the Group Call Mode from the first 3 digits of the variable ID to the first 2 digits.
		D333AA Data Channel TTO Delay	
T1940 T1941	TRN4279A	N/A	Changes the Transmitter Turn On (TTO) Delay from 50 msec. to 100 msec.
		D334AA Voice Channel TTO Delay	
T1940 T1941	TRN4279A	N/A	Changes the Transmitter Turn On (TTO) Delay from 250 msec. to 425 msec.
		D335AA Message Capability	
T1941	N/A	N/A	Supports coded message transmission; one through five messages.
		D131AB Lockswitch	
T1940 T1941 T1964	TRN4476A	TRN4474A	Replaces standard switch no. 2135 with optional switch no. 2141.
		D159AA Mechanical Lock	
T1940 T1941 T1964	TRN4475A	TRN4473A	Replaces standard lock no. 2135 with optional lock no. 2418.
		D264AB Delete Mobile Data Terminal Accessories	
T1940 T1941	N/A	TKN6458A TKN8127A TKN8130A TKN8126A TMN6143A TRN8777A TRN8793A TRN4471A TRN4468A	Deletes all Mobile Data Terminal accessories.
		D320__ Escutcheon Options	
T1941	See Option Instruction section.	TRN5530A	Replaces the standard escutcheon with special escutcheon per customer requirement.

CAUTION

Some options exclude others and some have to be chosen in pairs. For a compatibility check, contact a Motorola Sales Office.

OPTION CHART (CONT'D.)

Model	Kit Added	Kit Omitted	Description
		D176AA Mitrek Radio Cable	
T1940, T1941 T1964	TKN8243A	TKN8127A	Allows connection to negative ground *Mitrek* radio set.
		D177AA Mitrek Radio Positive Ground	
T1940 T1941 T1964	TKN8077A TRN4239A TRN4240A TRN4472A	TRN4471A	Allows connection to positive ground *Mitrek* radio set. **CAUTION:** This option must go together with D176AA.
		D178AA Omit Hang-Up Clip	
T1940 T1941 T1964		TRN8777A	Deletes the Hang-Up Clip
		D180AA Omit Handset	
T1940 T1941 T1964		TMN6143AA	Omits the handset and armored cable.
		D175AA Remote Entry of Unit ID	
T1941	TRN5135AA	TRN8721A	Allows entry of variable ID from the fixed end.

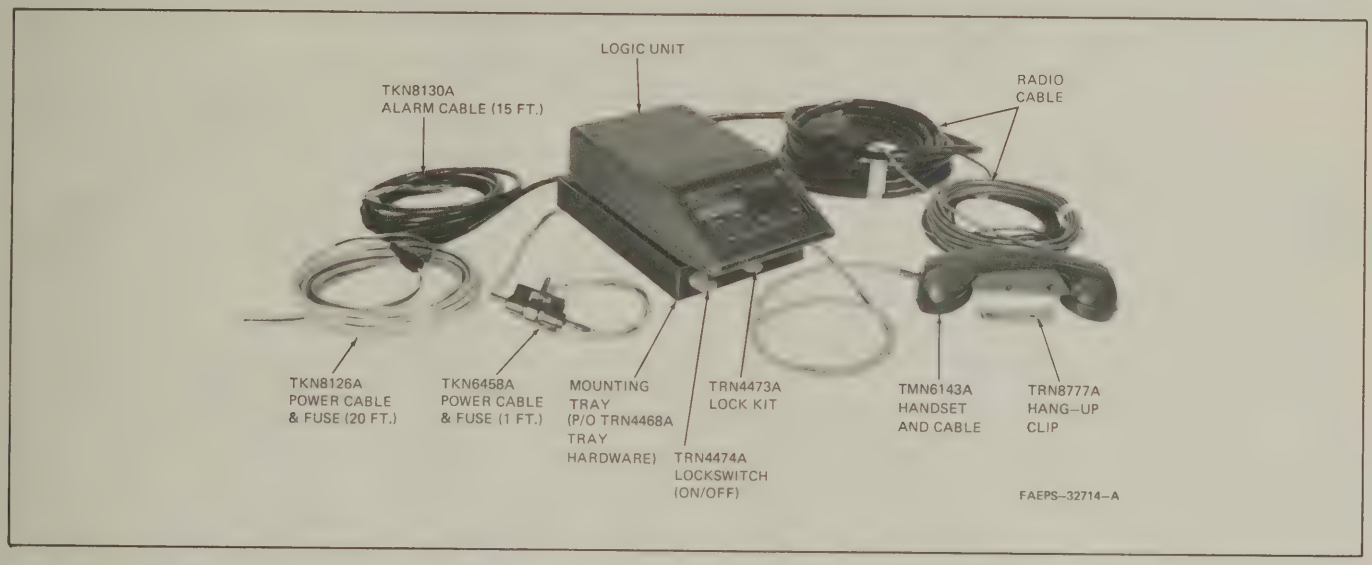

Figure 1.
T1941 Mobile Data Terminal (With Driver PA Option)

1. INTRODUCTION

1.1 The MCT-1200 Mobile Communications Terminal, also called *Metrocom II* Mobile Communications Terminal, is one of a family of Motorola mobile data terminals. It is a microcomputer based product capable of detecting, storing and processing driver entered commands and outputs from sensors monitoring mechanical functions of the vehicle. The mobile data terminal interfaces with a mobile radio forming a mobile subsystem capable of controlling voice and processing data communications. When utilized in a computerized dispatch system, mobile terminals are almost completely operated under computer software and dispatcher control to facilitate efficient fleet communications.

1.2 The central computer is interfaced to a designated rf channel(s) for data communications with the network of mobile terminals. The computer systematically polls each terminal or all terminals in the system for general or detailed types of data. The polled mobile terminal automatically transmits stored data messages back to the computer where the information is logged and/or displayed. Data polling and responses occur without interruption to the driver or the dispatcher.

1.3 Voice communications between the mobile operator and the dispatcher takes place on user assigned voice rf channels. The dispatcher has remote control of the mobile voice communications capability. Dispatchers can perform remote mobile channel selection and selective calling to eliminate simultaneous mobile transmissions over the same voice channel. While voice communications are taking place between the driver(s) and the dispatcher, other terminals are being polled for data by the computer on the data channel(s).

2. STANDARD FEATURES

The T1940 and T1941 Mobile Data Terminals when installed in a system, provide the following features:

- Selective Calling — Dispatcher can selectively call an individual vehicle, a group of vehicles, or all vehicles.

- Alarm Detection — Two types of alarms are provided. One is an emergency alarm activated by the driver, and the other is a mechanical alarm activated from a closure of a vehicle sensor. Up to six discrete mechanical alarms can be monitored.

- Emergency Alarm Test — Operational check of the emergency alarm feature can be made by the dispatcher without interrupting the driver. This verifies that the radio set and data terminal are functioning correctly.

- Request-to-Talk — This function is activated by the operator when conversation with the dispatcher is desired.

- Priority Request-to-Talk — This function is activated by the operator when an urgent need for conversation with the dispatcher exists. This function has priority over request-to-talk function.

- Lockswitch — Allows authorized personnel to turn the terminal on or off by keyswitch rather than automatically using the vehicle run switch.

- A+ Filtering — A+ filtering for the terminal removes interference due to fluorescent lights, alternator, etc.

- Message Acknowledgement — Data terminal sends an acknowledge message back to the computer whenever an individual data message is received. Similarly, the computer sends an acknowledge message to the data terminal whenever a mobile message is initiated by the terminal operator. This provides positive indication that messages have been received.

- Security Lock — The terminal is secured to its mounting assembly through a key lock. (The key is common to the switch lock.)

- Dispatcher Public Address — Remote public address is available to the dispatcher, upon data command, to make announcements on vehicles (trains, buses, etc.).

- Remote Frequency Selection — Up to four rf frequency channels may be remotely selected by data command from the dispatcher. This ensures the mobile radio set is operating on the proper channel and permits planned, efficient use of communication channels.

- Peripheral Data Collection — The terminal can be interrogated by the central computer to obtain data from up to seven peripheral devices, i.e., odometer, vehicle location, passenger counter, printer, and other possible devices.

- Auxiliary Outputs — The mobile terminal can be commanded by a data message from the central computer to perform up to eight auxiliary functions (four with eight-frequency radios).

- Variable ID — The driver is able to input a six-digit work assignment number into the terminal which is displayed by the LCD (liquid crystal display) on the control panel. (Applicable to T1941 only.)

- Fixed ID — A five-digit fixed identification is internally programmed into the terminal. This is typically the vehicle number. It is set by a technician and is not available to unauthorized personnel.

In applications having Variable ID as well as Fixed ID, the computer is able to interrogate the terminal by either ID, commanding it to reply with the other ID. This is particularly useful in automatic construction of vehicle correlation tables.

3. OPTIONAL FEATURES

The following is a list of some optional features which may be implemented with the mobile data terminal. For other available options and option details, refer to the option chart in the front of this manual.

- Driver Public Address — The driver PA feature permits the driver to make announcements to passengers in the vehicle. This option applies to Model T1941 only and entails the addition of one switch to the switch board of the front panel. Also, an optional escutcheon is required. (Mobile radio must also be equipped with this feature to permit proper operation.)

- Message Capability — The terminal operator may activate up to five pre- defined messages which may be processed by the central computer; e.g. 'Start Run', 'End Run'. This option applies to Model T1941 only and entails the addition of one to five extra switches (as required) to the switch board of the front panel. Also, a four-conductor ribbon cable is added to interconnect the switches to the display board. In addition, an optional escutcheon is required.

- Escutcheon Option — Replaces the standard escutcheon. It contains indicator lenses, switch buttons, and labeling as required by customers or other options.

- Radio Positive Ground — Provides circuitry for operation of the mobile data terminal with a positive ground *Micor* radio. This option consists of a positive ground board with mounting hardware and an electrical interconnect cable. The positive ground board mounts in the housing top of the logic unit. The cable electrically interconnects the positive ground board to the MPU board of the logic unit. Also included is a

positive ground radio cable which replaces the standard negative ground radio cable.

- Inverted Control Panel — Inverts the logic unit front panel assembly to permit vertical or overhead mounting.

4. MODEL COMPOSITION

4.1 GENERAL

The MCT-1200 and *Metrocom II* Mobile Communications Terminals are available in two different models: T1940 and T1941 Mobile Data Terminals. Both models consist of a logic unit and accessories. (See Figure 1.)

4.2 LOGIC UNIT

The logic unit contains the operating controls, displays, microcomputer and radio/sensor interface circuitry. The logic unit comprises the following assemblies.

4.2.1 TLN2019A Front Panel (with/LCD)

This kit is used with the T1941 Mobile Data Terminal. It consists of a TRN8714A Front Panel Hardware and TRN8713A Display and Switch Boards. The six-digit LCD, LCD heater, and LCD night lighting are part of front panel hardware and are mounted on the display board along with five LED indicators, LED driver circuitry, and LCD driver circuitry. Eight switches, six for LCD entry and two for request-to-talk functions, are located on the switch board. The switch board electrically connects to the display board with a 12-conductor ribbon cable. A 34-conductor ribbon cable electrically connects the display board to the MPU board. In addition, the display board provides interconnection between the switch board and the MPU board.

4.2.2 TLN2020A Front Panel (without LCD)

This kit is used with the T1940 Mobile Data Terminal. It consists of TRN8719A Front Panel Hardware and TRN8718A Display and Switch Boards. Four LED indicators and LED driver circuitry are located on the display board. Two switches, used for request-to-talk functions, are located on the switch board. A 12- conductor ribbon cable electrically connects the switch board to the display board.

4.2.3 TRN8715A MPU Board

This board contains the logic and discrete circuits needed to decode received messages, encode digital information, initialize and transmit emergency alarm information, and respond to various data requests from the computer. In addition, the MPU board contains circuitry for handset audio/squelch, alert tone, and Time-Out-Timer (TOT) functions.

4.2.4 TRN8721A Microcomputer and ROM with I/O

This kit consists of two integrated circuits which plug into sockets located on the MPU board; one is the microcomputer (U208) and the other is the ROM with I/O (U209).

4.2.5 THN6382A Housing Top

This kit contains a speaker, top of the logic unit housing, and part of the power supply regulator circuitry. The housing provides a facility for mounting the front panel, speaker, and regulator circuit. An 8- conductor cable electrically connects circuits in the housing top to the MPU board.

4.2.6 TRN8720A Housing Hardware

This kit contains the bottom and rear housings, and the hardware for mounting the MPU board and fastening the logic unit housing parts together.

4.2.7 TRN5530A and TRN5529A Escutcheon For Models T1940C and T1941C Only)

The escutcheon covers the switch panel and contains lenses for indicators, buttons for switches, and labeling for both. The TRN5530A is used with the T1941 Mobile Data Terminal and has the following:

- four lenses and labeling for PWR, TX, ACK, and CALL indicators.
- buttons and labeling for work assignment (ROUTE AND RUN requires 6 buttons), REQUEST, and PRIORITY switches.
- cutout for the six-digit LCD.

The TRN5529A Escutcheon is used with the T1940 and is similar to the TRN5530A, except it has no work assignment switch buttons and labeling, and no LCD cutout.

4.2.8 TRN8775A and TRN8792A Escutcheon (For Models T1940A/B and T1941A/B Only)

The escutcheon covers the switch panel and contains lenses for indicators, rubber buttons for switches, and labeling for both. The TRN8775A is used with the T1941 Mobile Data Terminal and has the following:

- four lenses and labeling for PWR, TX, ACK, and CALL indicators.
- rubber buttons and labeling for work assignment (ROUTE AND RUN requires 6 rubber buttons), REQUEST, and PRIORITY switches.

- cutout for the six-digit LCD.

The TRN8792A Escutcheon is used with the T1940 and is similar to the TRN8775A, except it has no work assignment switch rubber buttons and labeling, and no LCD cutout.

4.3 T1964 MOBILE DATA TERMINAL ACCESSORIES

The accessories include all the kits necessary for vehicle installation of the mounting and cabling required for installation of the logic unit; which can be relocated from one vehicle to another. The accessories are described below.

4.3.1 Cable and Hardware Kits

- TKN6458A Power Cable and Fuse (1 ft) — connects radio power line filter to vehicle battery hot side.
- TKN8127A Radio Cable (22 ft.) — connects logic unit to a *Micor* or *SYNTOR* (negative ground) Mobile Radio.
- TKN8130A Alarm Cable (15 ft.) — connects logic unit, six mechanical alarm sensors, emergency alarm switch, and the mounting tray filter board.
- TKN8126A Power Cable (20 ft.) — connects vehicle battery to mounting tray filter board.
- TRN4468A Tray Hardware — contains the mounting tray which houses the filter board and serves as a mounting for the logic unit. Also included is a tray mounting plate and required hardware.
- TRN8793A Installation Hardware — includes the required hardware for installing the mounting plate to the vehicle.

4.3.2 TRN4471A Filter Board

The filter board provides A+ filtering for the logic unit. It also interconnects the handset and logic unit, radio and PA speaker, and filtered A+/A- and radio (ORG/GRN leads).

4.3.3 TMN6143A Handset

The handset is a telephone-type with earpiece, mouthpiece, and push-to-talk (PTT) switch.

4.3.4 TRN8777A Hang-Up Clip

The hang-up clip holds the handset securely when it is not in use.

4.3.5 TRN4474A Lockswitch

The lockswitch (power ON/OFF) mounts on the mounting tray and is electrically inserted in the A+ input line at connecting points on the filter board.

4.3.6 TRN4473A Lock Kit

The lock kit mounts on the mounting tray and provides a secure mechanical interlock between the tray and the logic unit.

MOTOROLA INC.
Communications
Group

INSTALLATION
MCT-1200 AND *METROCOM* II
MOBILE COMMUNICATIONS TERMINAL

1. INSPECTION

1.1 Inspect the equipment for any possible damage during shipment. If any damage is noted, submit a claim to the transporation company immediately.

1.2 Inspect the packing materials for loose components before discarding the materials.

2. GENERAL INSTALLATION

The following installation is divided into four sections. The procedures of each section can be performed independently or in succession as required. The sections are as follows:

- Accessories Installation — procedures for vehicle installation of the mounting and cabling required for installation of the logic unit.
- Logic Unit Set Up — procedures for internal jumper settings, switch settings, and positive ground conversion.
- Logic Unit Installation — procedure for electrical and mechanical connection of the logic unit to the installed vehicle accessories.
- Logic Unit Removal — procedure for electrical and mechanical disconnection of logic unit from the installed vehicle accessories.

NOTE

(See Figure 1.) Before performing any of the installation procedures, the installer should make sure that mounting locations for the logic unit, radio set, PA speaker, and power line filter are carefully selected. Consideration should be given to the length of cable runs between units to insure that the cable kits supplied can be properly installed. Also make sure that the equipment is mounted in a location that permits accessibility to all cable connectors.

3. ACCESSORIES INSTALLATION

3.1 MOUNTING TRAY INSTALLATION

The mounting tray is shipped from the factory with the filter board, switchlock, lock, and handset cabling assembled as one unit. Mount the tray, hang-up clip, and emergency alarm switch and install the cables as described below. (See Figure 2.)

Step 1. Using the mounting plate as a template, drill one 2-inch diameter hole, and four .218 inch diameter holes in the mounting surface.

Step 2. Install a rubber grommet in the 2-inch diameter hole.

Step 3. Secure the mounting plate to the vehicle mounting surface, using four 10-32 x 5/8 inch screws, washers, and locknuts.

Step 4. Route the cables as shown in Figure 1.

Step 5. Pass the following interconnecting cables through the 2-inch diameter hole in the mounting surface and mounting plate and into the mounting tray.

- TKN8126A Power Cable (connector end)
- TKN8130A Alarm Cable (dual connector end)
- Radio Cable (dual connector end)
- PA Speaker Cable (connector end)

Step 6. (See Figure 3.) Connect the following cables to the mounting tray filter board.

- PA speaker cable connector to filter board jack J4.
- Pass the alarm cable black connector through opening in the mounting tray and connect the other connector to filter board jack J2.
- Connect power cable connector to filter board jack J1.

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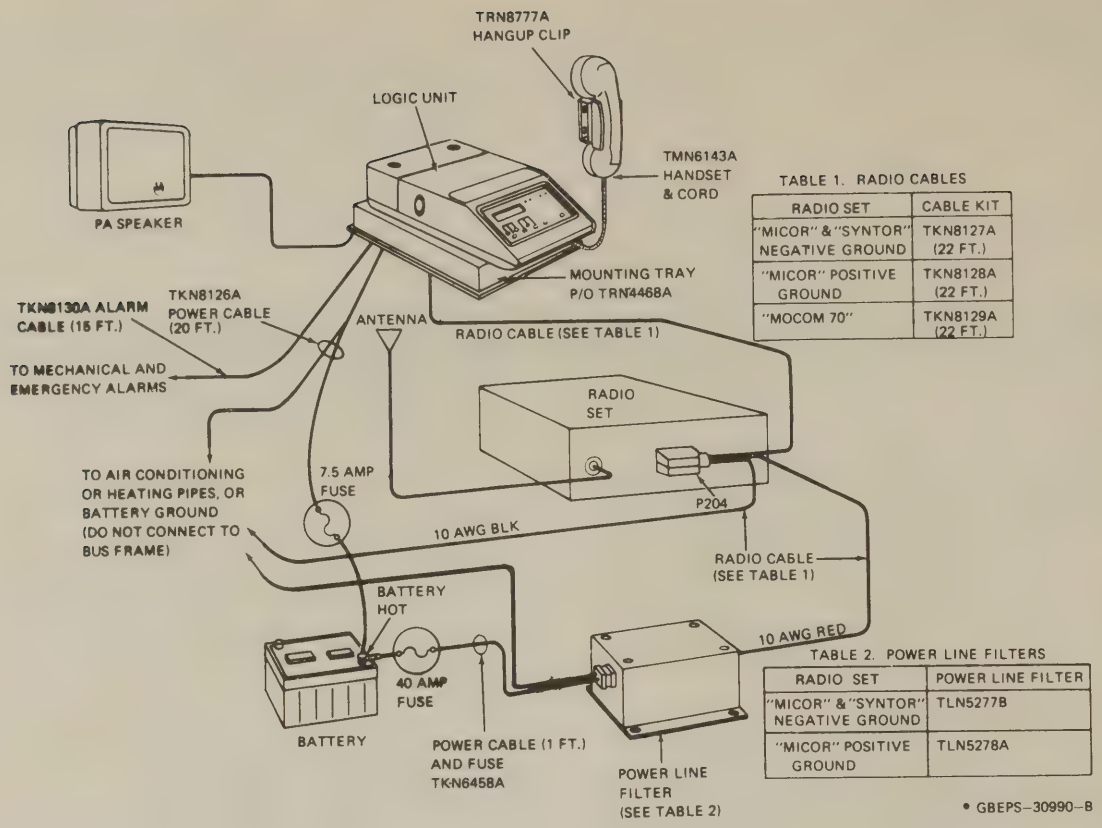


TABLE 1. RADIO CABLES

RADIO SET	CABLE KIT
"MICOR" & "SYNTOR" NEGATIVE GROUND	TKN8127A (22 FT.)
"MICOR" POSITIVE GROUND	TKN8128A (22 FT.)
"MOCOM 70"	TKN8129A (22 FT.)

TABLE 2. POWER LINE FILTERS

RADIO SET	POWER LINE FILTER
"MICOR" & "SYNTOR" NEGATIVE GROUND	TLN5277B
"MICOR" POSITIVE GROUND	TLN5278A

Figure 1. MCT-1200 and ***Metrocom II*** *Mobile Communications Terminal Installation Diagram*

- Pass the radio cable blue connector through opening in the mounting tray and connect the other connector to filter board jack J3.

- Provide strain relief for cables as shown and pass green grounding wire through opening in the mounting tray.

Step 7. Remove and discard the two RED-BLK wires from mounting tray filter board terminals T1 and T2. (These wires were used for factory testing).

Step 8. (See Figure 2.) Secure the mounting tray to the mounting plate, using four captive screws in the mounting tray.

Step 9. Remove the two screws from the side of the hang-up clip and separate the clip from the metal bracket.

Step 10. Using the handset hang-up clip bracket as a template, drill two .218 inch diameter holes in the mounting surface.

Step 11. Secure the handset hang-up clip bracket to the mounting surface using two 10-32 x 5/8 inch screws, washers, and locknuts.

Step 12. Re-assemble the hang-up clip by reversing Step 9.

3.2 MECHANICAL ALARM CONNECTIONS

Connect mechanical alarms to provide a closure (in an alarm condition) between the desired wire in the alarm cable and battery ground in a negative ground system (or the logic ground wire supplied in the alarm cable (BRN-YEL) in a positive ground system). Mechanical alarm 1 is defined as air pressure alarm and mechanical alarm 2 is defined as fare box alarm. The remaining mechanical alarms 3 thru 6, can be connected to any other sensors. Refer to Table 1 for alarm cable connections.

NOTE

Mechanical alarm disable J201-3 must be connected to a logic low to enable mechanical alarm inputs. If J201-3 is open (logic high through pull-up resistor), only mechanical alarm 2 input is enabled.

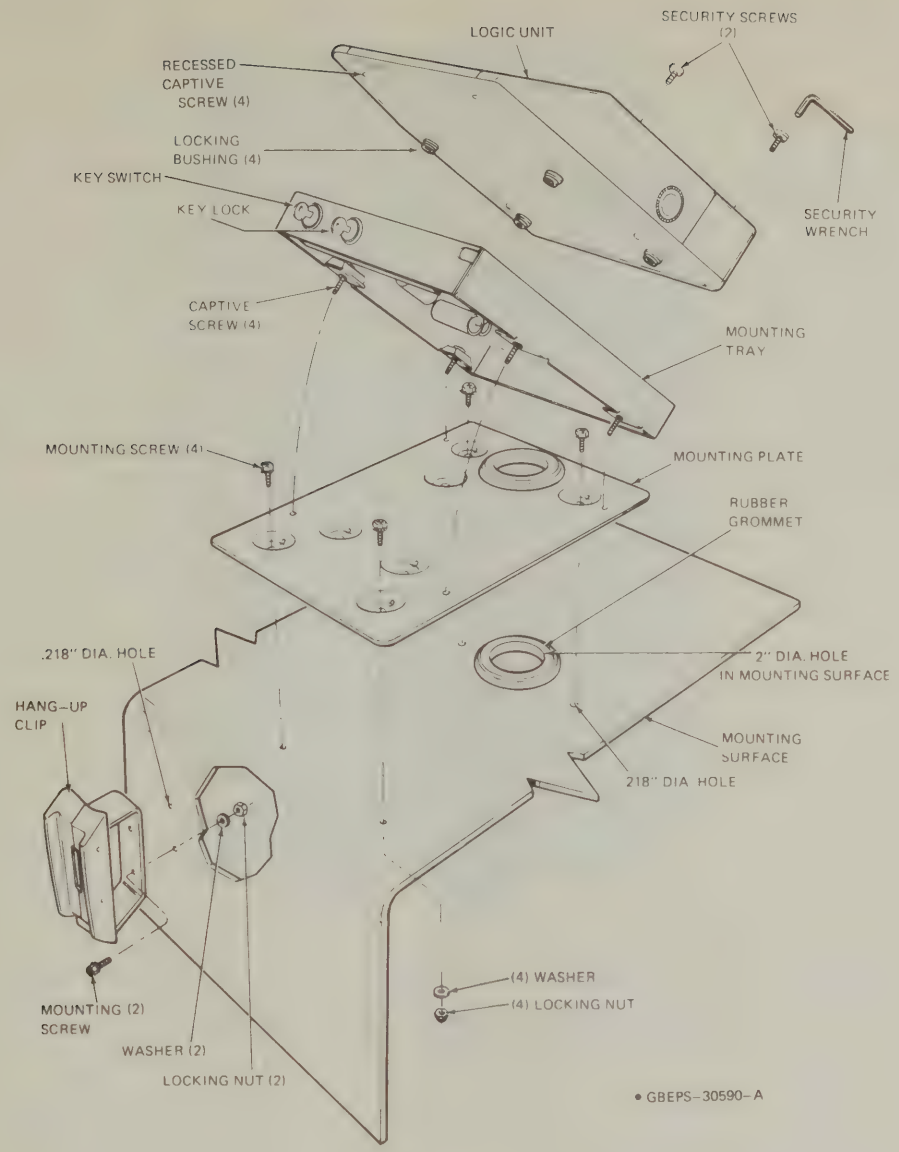


Figure 2. Mounting Detail

Table 1.
TKN8130A Mechanical Alarm Cable Connections

Mechanical Alarms	Wire Color	Connector
1	WHT-VIO	P201-4
2	WHT-BLU	P201-5
3	BRN-BLK	P201-19
4	YEL-BLU	P201-7
5	BRN-ORG	P201-9
6	WHT-GRN	P201-6
AUX 6	GRY	P201-20
AUX 7	RED-WHT	P201-22
Logic GND*	BRN-YEL	P201-2
SPARE (Not Used)	BRN-GRN	P201-14
Emergency Alarm	ORG (Coax)	P201-11
Mechanical Alarm Disable	YEL-ORG	P201-3

* Positive Ground Systems Only

3.3 EMERGENCY ALARM SWITCH INSTALLATION (See Figure 4.)

Step 1. Determine the location for the dash mount switch. *Mounting panel should be less than 1/8 inch thick.*

Step 2. Drill a 41/64 (.640) inch diameter hole in the selected location.

Step 3. Wire the switch to provide a normally closed contact between the alarm wire and battery ground in a negative ground system (or the logic ground supplied in the alarm cable (BRN-YEL) in a positive ground system). In a negative ground system connect this point to the same place the battery ground and logic unit ground are connected. It should be relatively free of electrical noise and transients.

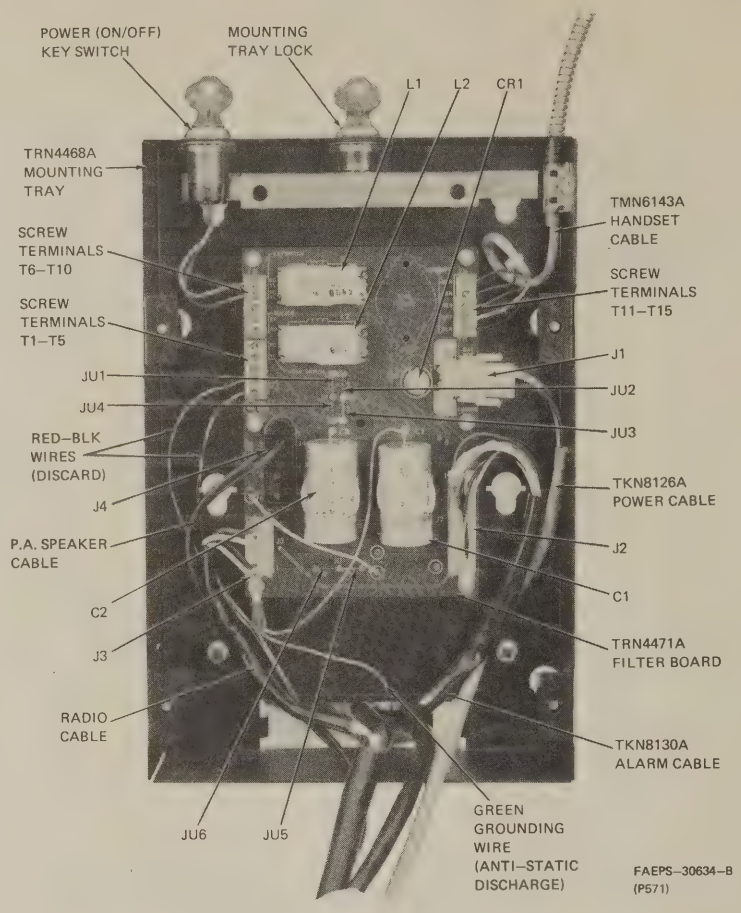


Figure 3. Mounting Tray Filter Board Cabling Detail

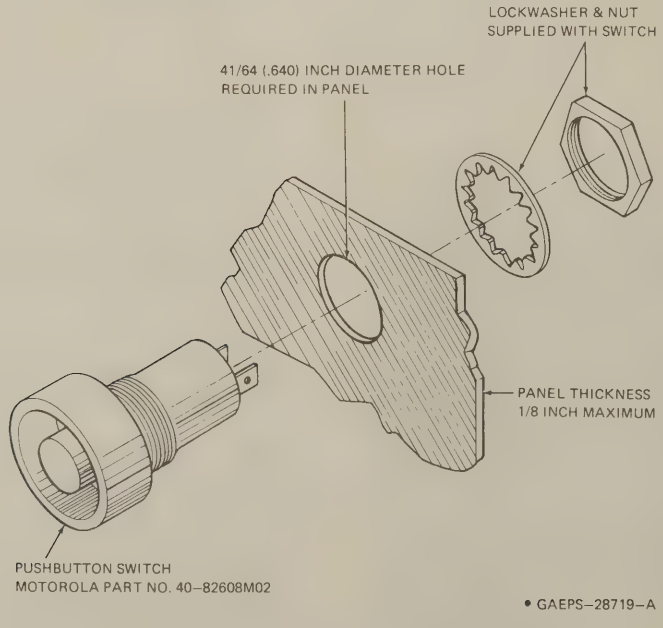


Figure 4. Alarm Switch Mounting Detail

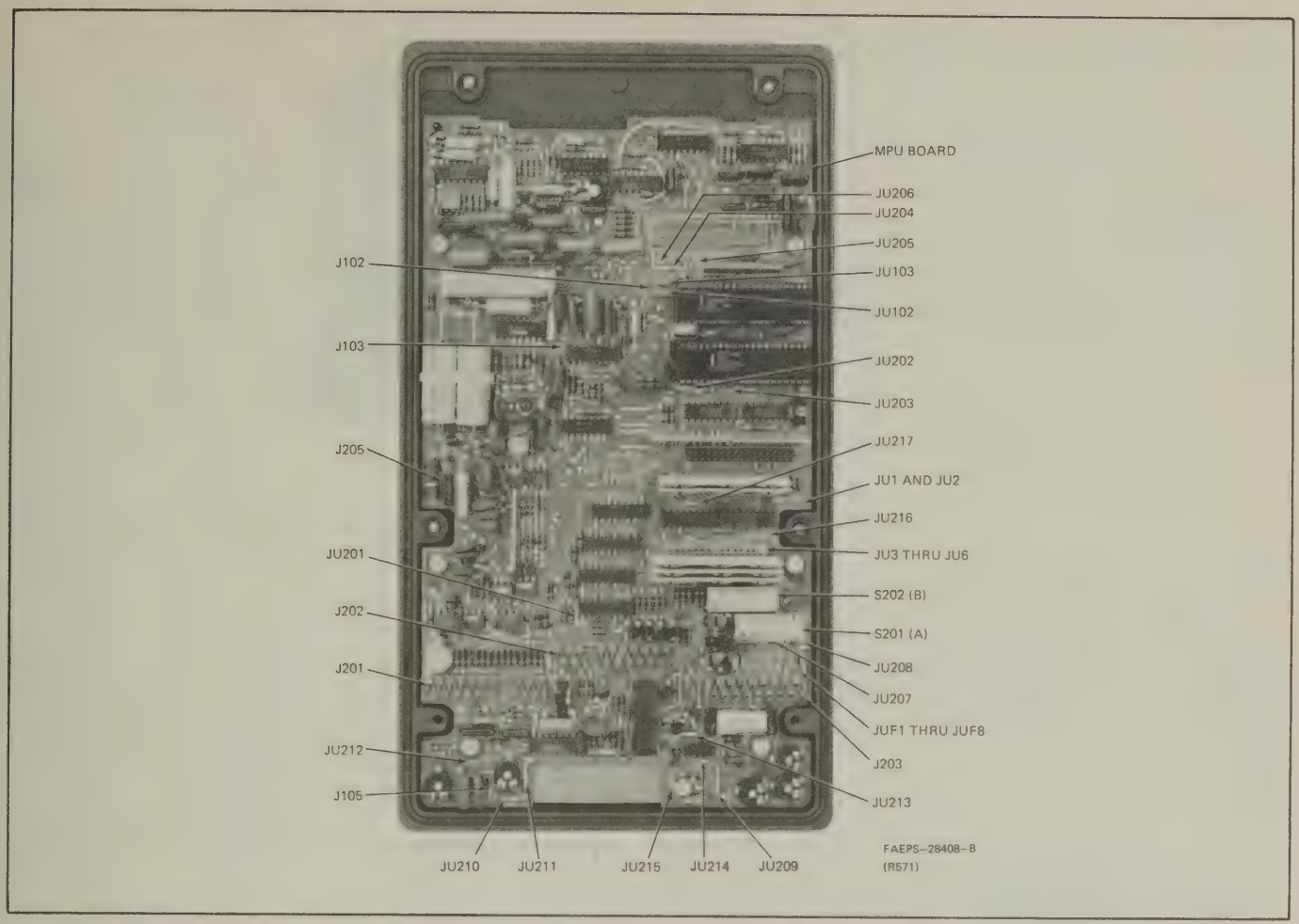


Figure 5.
Logic Unit Jumper and Switch Location Detail

3.4 POWER CONNECTIONS

3.4.1 Connect the white lead of the power cable from mounting tray filter board J1-1 to the battery hot terminal. This allows the mobile data terminal to be powered up when the vehicle run switch is off.

3.4.2 Connect the black lead of the power cable from mounting tray filter board J1-2 to the battery ground terminal. To eliminate electrical noise pick- up on the power cable, connect the cable shield to battery ground. The vehicle air conditioning or heating pipes can be used as a battery ground connecting point, but do not use the vehicle frame.

NOTE

All power connections should be connected to a single physical point and all ground connections should be connected to a single physical point. Therefore, ground connections for the radio, data terminal, and all peripherals must be tied together. This is required to eliminate the possible creation of ground loops.

4. LOGIC UNIT SET UP

4.1 GENERAL

Figure 5 shows jumper and switch locations on the logic unit MPU board. Use this figure to locate jumper connections and switches described in the following paragraphs.

4.2 SWITCH AND JUMPER ACCESS

The switches and some jumpers can be accessed by removing the rear housing only. Other jumpers require removal of the rear housing, top housing, and MPU board. Perform the following steps as necessary. (See Figures 2 and 5.)

Step 1. Remove the rear housing by removing two security screws and lifting the housing up.

Step 2. Remove the top housing by loosening the four recessed captive screws in the bottom housing and lifting the top housing up.

Step 3. Remove the MPU board by removing the six board mounting screws and lift board out of the bottom housing.

Step 4. To reassemble, reverse Steps 1 through 3.

4.3 FREQUENCY SELECT JUMPERS

4.3.1 Jumpers JUF1 thru JUF8 determine the selected rf frequency. These jumpers are connected for either fixed or remote frequency selection.

NOTE
Do not connect jumpers for simultaneous fixed and remote operation; use either fixed or remote operation.

4.3.2 The following is an example of a fixed frequency jumper connection. As shown in Figure 6, frequency F1 is selected by the jumper JUF1 between terminals C and B. Any one of the frequencies between F2 thru F8 is selected in a like manner by placing a jumper between terminals C and B of the required frequency.

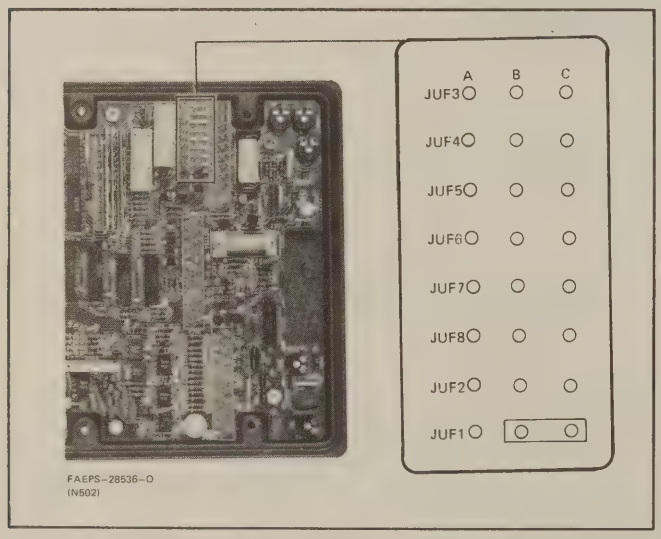


Figure 6. Fixed Frequency Selection

NOTE
Only one jumper (JUF1-JUF8) at a time may be inserted in the fixed frequency select position.

4.3.3 The following is an example of a remote frequency jumper connection. As shown in Figure 7, frequencies F1 thru F8 are selected for remote operation by placing jumpers between terminals A and B. The frequency capabilities of the radio set determine the jumper combination.

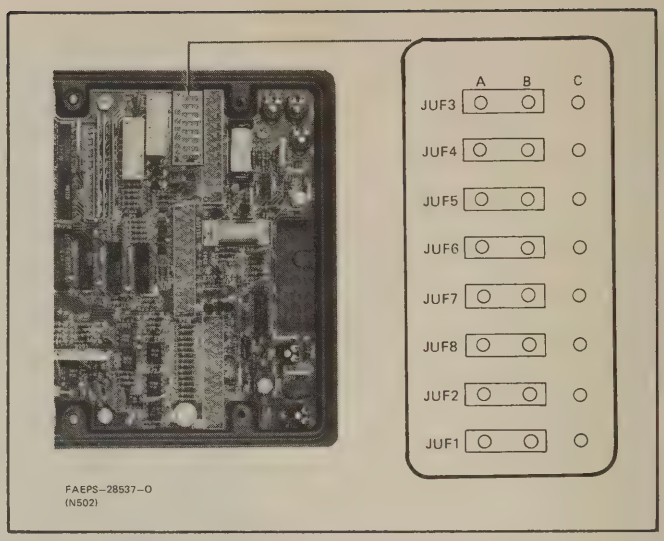


Figure 7. Remote Frequency Selection

4.4 VEHICLE FIXED ID
(See Figure 8.)

4.4.1 DIP switches S201 and S202 (each containing ten switches) are used to select the fixed identification (FID) number of the vehicle. Each DIP switch controls ten selectable address lines for a total of 20. All 20 switch controlled lines provide an FID consisting of 5-digits (normally the vehicle number) which cover a range from 00000 to 99999. *DO NOT* use 0000 as a valid FID.

4.4.2 A binary coded decimal (BCD) sets the value of each of the 5-digits. Each digit requires 4 switch position combinations. B1, B2, A1, and A2 set the least significant digit; and B3, B4, B5 and B6 set the most significant digit. The BCD coding for each decimal number is shown in Table 2.

Table 2. Decimal-to-BCD Conversion

Decimal	BCD
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

NOTE
Moving a switch to the UP or 'ON' position as shown in Figure 8 sets a binary one (1).

4.4.3 Table 3 shows an example of how to set a 5-digit fixed identification number into DIP switches S201 and S202. In the example, FID number 14325 is used.

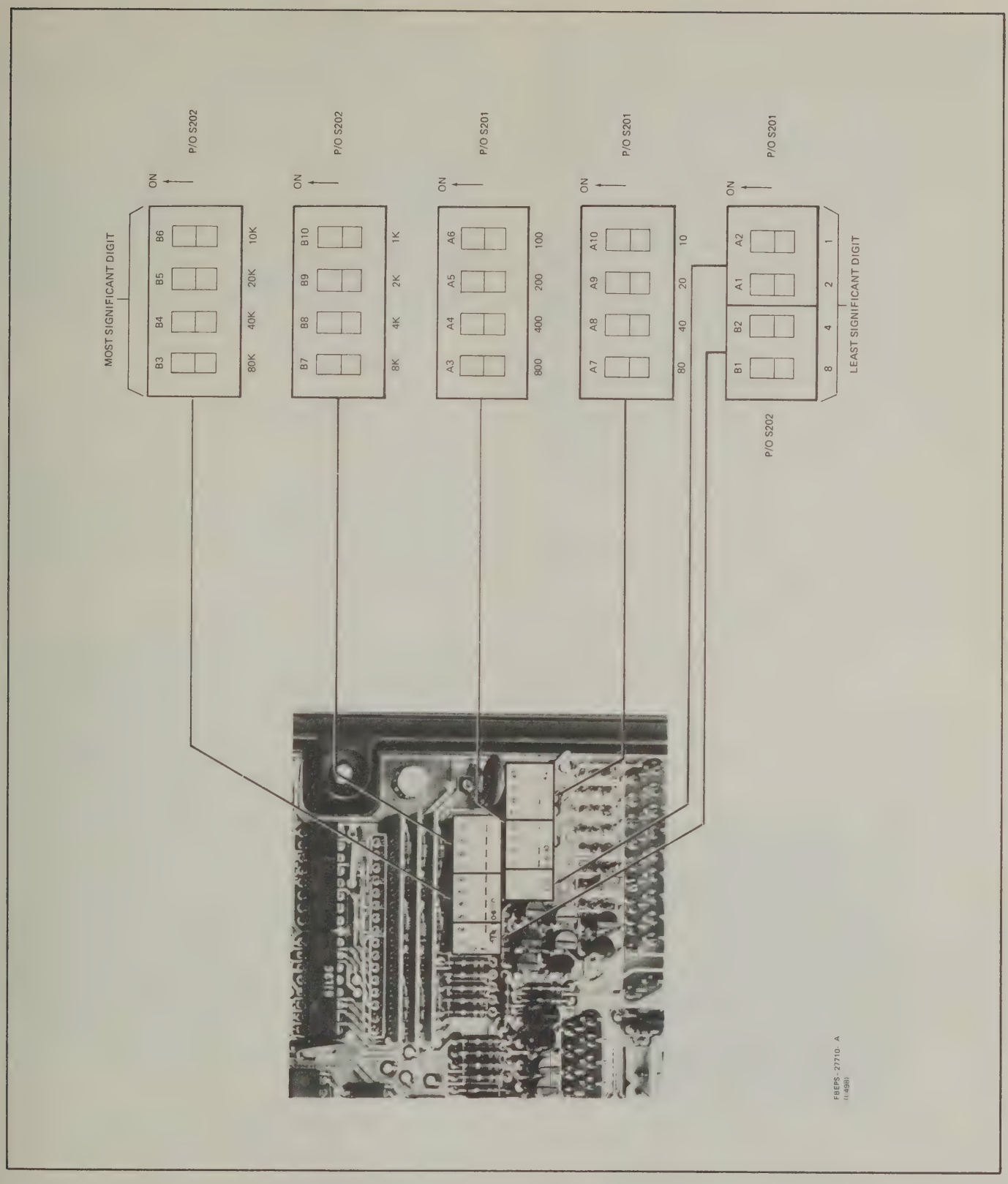


Figure 8. DIP Switches S201 and S202

Table 3. FID Number Entry

Decimal Number	Switch Number	On	Off	BCD Code	
1	B3		X	0	Most
	B4		X	0	Significant
	B5		X	0	Digit
	B6	X		1	(MSD)
4	B7		X	0	
	B8	X		1	
	B9		X	0	
	B10		X	0	
3	A3		X	0	
	A4		X	0	
	A5	X		1	
	A6	X		1	
2	A7		X	0	
	A8		X	0	
	A9	X		1	
	A10		X	0	
5	B1		X	0	Least
	B2	X		1	Significant
	A1		X	0	Digit
	A2	X		1	(LSD)

4.5 OPTION SELECTION JUMPERS

Jumpers JU1-JU6 are installed for option selection. For jumper settings, refer to Table 4. For jumper locations, refer to Figure 9.

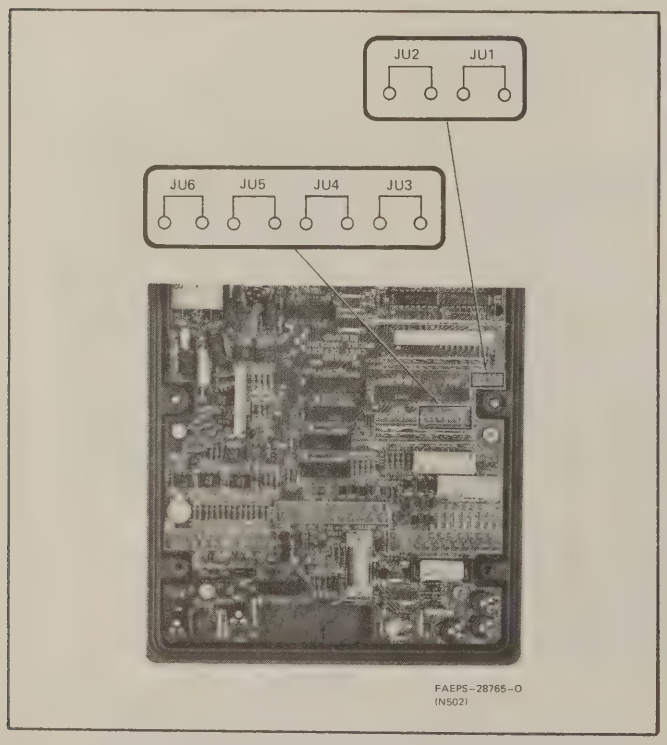


Figure 9. Option Selection Jumpers Detail

Table 4. Option Selection Jumpers

Jumper	In	Out	Comment
JU1	—	—	SPARE
JU2	2 digit	3 digit	Number of group call comparison VID digits (MSB)
JU3	100 ms	50 ms	Data channel transmitter turn-on time
JU4	425 ms	250 ms	Voice channel transmitter turn-on time
JU5	8	4	Number of frequencies that can be chosen for remote frequency switching
JU6	—	—	SPARE

4.6 SYSTEM TIMING

Table 5 shows the transmitter turn-on times required for various systems. Transmitter turn-on time is the length of time encoding or voice modulation is delayed after the terminal keys the mobile transmitter. This delay allows sufficient time for the base/repeater to respond to and process the transmission. If proper jumpers are not chosen, part or all of the transmission may be lost.

Table 5. System Timing

System Type	*Micor* Radio	*Mocom 70* Radio
Data Channel Transmitter Turn-On Time (Note 1)		
All	50 ms	100 ms
Voice Channel Transmitter Turn-On Time (Note 2)		
1. Carrier Squelch; No TAC	250 ms	250 ms
2. Carrier Squelch; TAC	250 ms	425 ms
3. PL Squelch; No TAC	250 ms	425 ms
4. PL Squelch; TAC	425 ms	425 ms
5. DPL Squelch; No TAC	425 ms	425 ms
6. DPL Squelch; TAC	425 ms	475 ms (Note 3)
7. PL repeater system with discriminator audio available to data decoder	250 ms	425 ms
8. DPL repeater system with discriminator audio available to data decoder	425 ms	425 ms

NOTES:

1. Data channel transmitter turn-on time is set by jumper JU3. See Table 4.
2. Voice channel transmitter turn-on time is set by jumper JU4. See Table 4.
3. Timing of 472 ms is not available on MCT-1200 (*Metrocom II*) Terminals.
4. PL = *Private-Line* Tone Coded Squelch, DPL = *Digital Private Line* Binary Coded Squelch

4.7 NEGATIVE AND POSITIVE GROUND APPLICATIONS

4.7.1 Polarity Jumper Connections

The logic unit and mounting tray filter board operate from either a negative or positive ground power source. Unique jumper connections are required for each type of power source. See Tables 6, 7, and 8 for jumper connections. See Figures 3 and 5 for jumper locations.

NOTE

Positive ground operation is optional and requires conversion kits as well as the jumper changes described in Tables 7 and 8. Refer to the option chart, in the front of this manual, for Positive Ground Option D121AC model complement.

Table 6. Logic Unit Jumpers (Negative Ground)

Jumper	Installed	Removed
JU207	X	
JU208		X
JU211	X	
JU212		X

Table 7. Logic Unit Jumpers (Positive Ground)

Jumper	Installed	Removed
JU207		X
JU208	X	
JU210		X
JU211		X
JU212	X	
JU213		X
JU214		X
JUF1 thru JUF8		X

Table 8. Mounting Tray Filter Board Jumpers

	Negative Ground		Positive Ground	
Jumper	Installed	Removed	Installed	Removed
JU1	X			X
JU2		X	X	
JU3	X			X
JU4		X	X	
JU5	X			X
JU6		X	X	

4.7.2. Positive Ground Option Installation

(Refer to Figure 10.)

The Positive Ground Option is factory or field installed. Field installation is as follows:

Step 1. Remove rear and top housings as described in Logic Unit Set Up paragraph.

Step 2. Mount TRN4239A Positive Ground Board with four 6-32 x 1/4" screws.

Step 3. Connect TKN8077A Board Interconnect Cable.

Step 4. Change logic unit jumpers per Table 7.

Step 5. Change the following mounting tray filter board component connections. (See Figure 3 for component location.)

- Change jumpers JU1-JU6 per Table 8.
- Reverse the polarity of C1, C2, and CR1.

Step 6. Replace TKN8127A Radio Cable with TKN8128A Radio Cable.

Step 7. Reassemble logic unit as described in Logic Unit Set Up paragraph.

5. LOGIC UNIT INSTALLATION

(See Figures 2 and 11.)

Step 1. Insert key into mounting tray lock and turn, one quarter turn, clockwise.

Step 2. Mount the logic unit by inserting four locking bushings into the mounting holes on the tray, and pushing the logic unit to the rear until it locks in place. To secure logic unit to mounting tray, turn key, one quarter turn, counterclockwise.

Step 3. Remove the rear housing from the unit by removing two security screws, and lifting the rear housing up.

Step 4. Connect plugs P201 (black) and P203 (blue) into jacks J201 and J203 respectively on the circuit board. Connect the green ground wire to the lug attached to the rear wall of the top housing.

Step 5. If necessary, adjust the volume and squelch controls at proper setting for the intended operation. Perform these adjustments as described in the Volume and Squelch Adjustment paragraph of the Maintenance section of this manual. (Power on/off is controlled by the keyswitch in the mounting tray and is indicated by the logic unit PWR LED.)

NOTE

The logic unit has no deviation adjustment. The transmit audio output level is fixed.

Step 6. Replace and secure the rear housing.

6. LOGIC UNIT REMOVAL

To remove the logic unit from the vehicle, use the following procedure. (See Figures 2 and 11.)

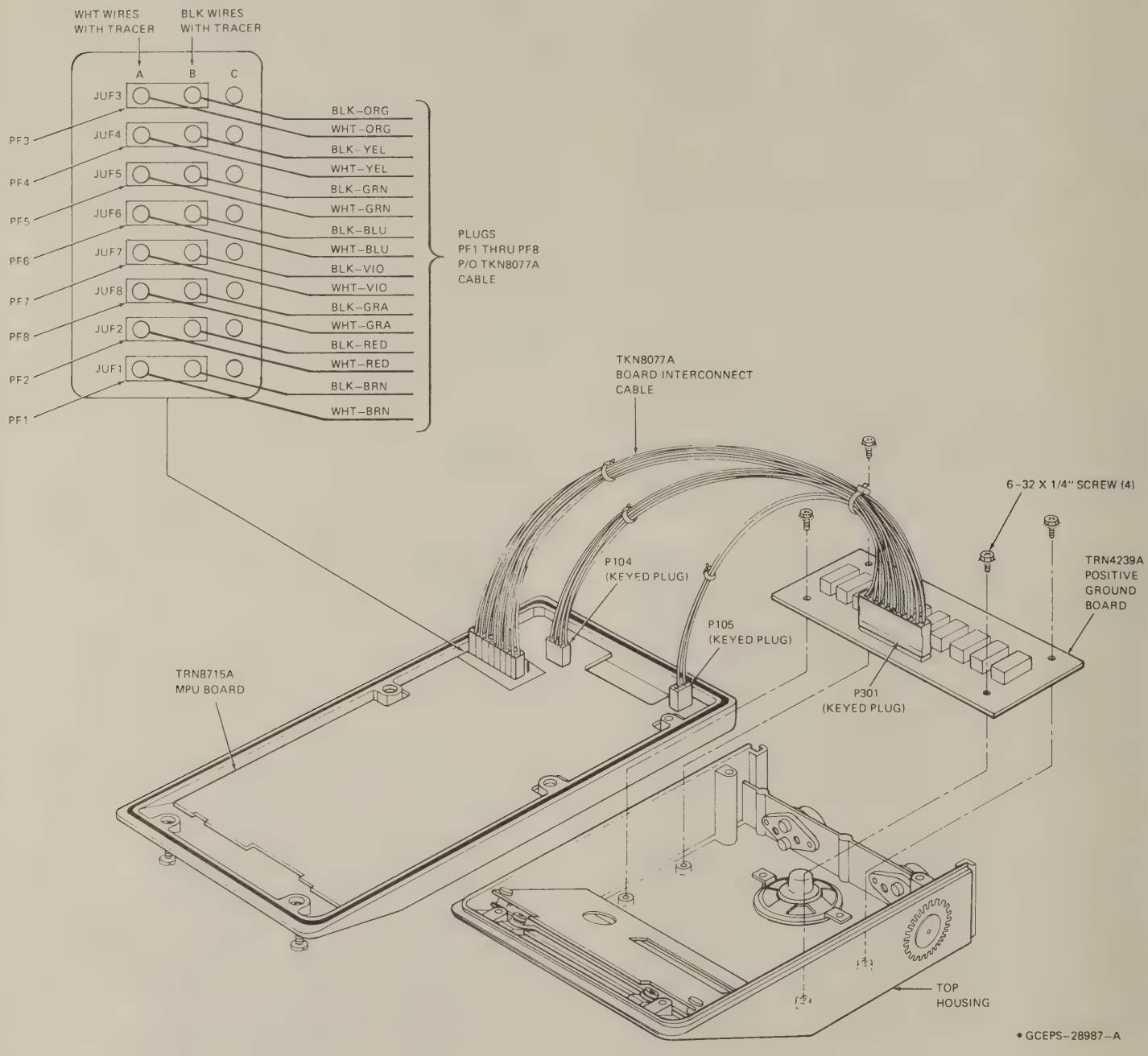


Figure 10. Positive Ground Option Installation Detail

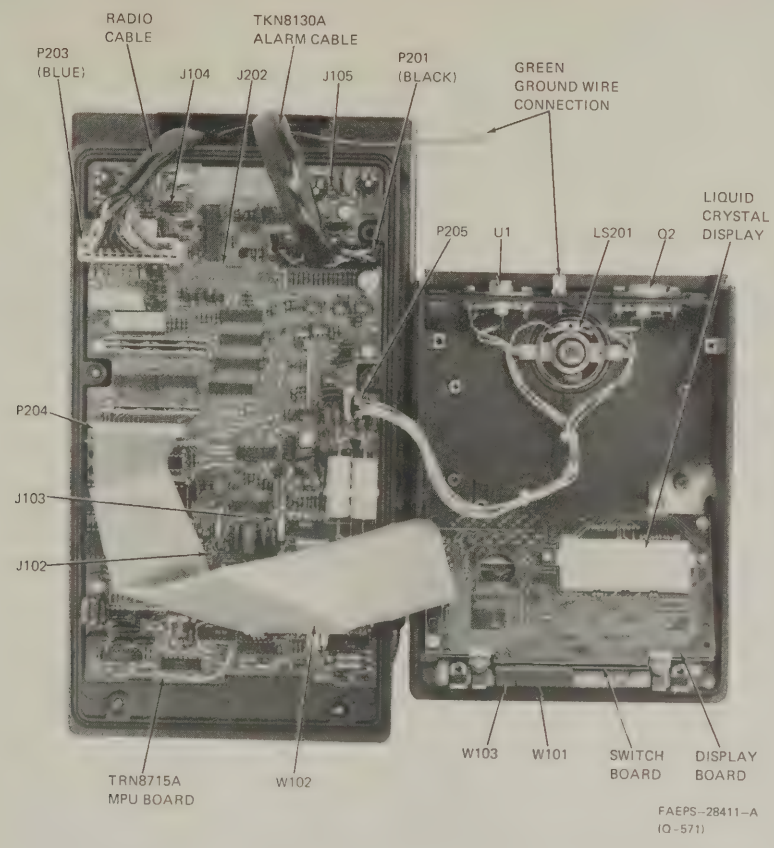


Figure 11. Logic Unit Cabling Detail

Step 1. Remove the rear housing by removing two security screws and lifting the housing up.

Step 2. Disconnect plugs P201 and P203 from the logic unit. Disconnect green ground wire from lug attached to the rear wall of the top housing.

Step 3 Insert the key in the lock on the mounting tray and turn the key, one-quarter turn clockwise; move the logic unit forward and lift it off the mounting tray.

Step 4. Replace the rear housing on logic unit with two security screws.

1. INTRODUCTION

1.1 For the most part, operation of the MCT-1200 and *Metrocom II* Mobile Communications Terminal is performed remotely by the dispatch center and locally by the vehicle operator. This section describes the controls, indicators, and procedures required for local operation.

1.2 In the discussion which follows, the Model T1941 Mobile Data Terminal, with Driver PA option, is described. In addition, operation of the message capability option is described.

2. CONTROLS AND INDICATORS
(Refer to Figure 1.)

2.1 GENERAL

2.1.1 The control panel contains visual indicators, switches, and liquid crystal display (LCD) which aid the local operator in determining the operating status of the terminal. In addition to the control panel indicators, the terminal provides audible indications as well.

2.1.2 The standard T1941 Mobile Data Terminal control panel contains four high intensity light emitting diode (LED) indicators (PWR, TX, ACK, and CALL), two command switches (REQUEST and PRIORITY), six work assignment entry switches (ROUTE and RUN), and a six-digit LCD. The Driver PA option adds another LED indicator (PA) and command switch (PA) to the control panel. The standard T1940 Mobile Data Terminal control panel is similar to the T1941 panel, except there is no LCD or work assignment entry switches.

2.1.3 The terminal is equipped with a keyswitch ON/OFF control (located on the mounting tray just below the lower left corner of the control panel) and a telephone type handset with a PTT switch in the handle.

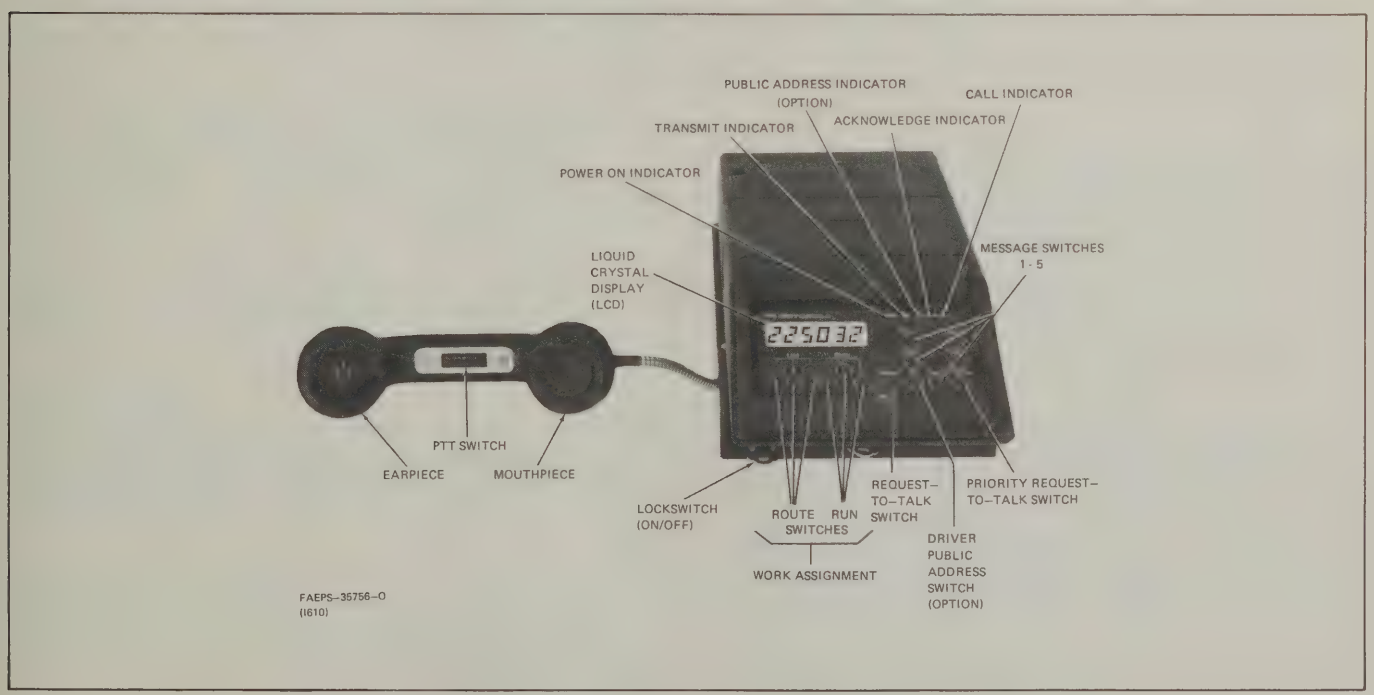


Figure 1. Operator Controls And Indicators (T1941 with/Driver PA Option)

2.1.4 A control panel switch function is activated by momentarily depressing the associated switch. Each time a switch is depressed, a beep is heard, verifying proper activation.

2.2 LIQUID CRYSTAL DISPLAY (LCD)

The six-digit LCD gives a visual indication of the work assignment (i.e. ROUTE and RUN) number entered by the operator. Any number from 000000 through 999999 inclusive can be displayed.

NOTE

Do not use the number 000000 as a valid entry.

2.3 ROUTE/RUN SWITCHES

The six switches, marked ROUTE and RUN on the standard escutcheon (optional escutcheon labeling is available), are used to enter the work assignment number of the vehicle. Each switch corresponds to the LCD digit directly above it. Momentarily depressing a switch increments the associated display digit. If the switch is held depressed, the digit continuously increments every half second. Every time the digit increments, a beep is emitted from the unit.

NOTE

If the terminal is in an ambient environment colder than −10 °F and power has been off, LCD operating speed may be reduced. In this case, wait a few minutes after applying power before making display entries. Alternatively, display entries can be made by determining the quantity of digit increments by counting the number of beeps.

2.4 REQUEST-TO-TALK SWITCH

When the request-to-talk switch (REQUEST) is depressed, the terminal generates a data message to the dispatch center indicating that the vehicle operator desires voice communications with the dispatcher.

2.5 PRIORITY REQUEST-TO-TALK SWITCH

When the priority request-to-talk switch (PRIORITY) is depressed, the terminal generates a data message to the dispatch center indicating that the vehicle operator desires immediate voice communications with the dispatcher. Priority request-to-talk function has priority over the request-to-talk function and is only used in urgent situations.

2.6 DRIVER PUBLIC ADDRESS SWITCH

When the driver public address switch (PA) is alternately depressed, it enables and disables driver public address function. When the function is enabled, communications between the terminal and the dispatch center are not affected.

NOTE

Mobile radio must be equipped for driver public address.

2.7 HANDSET

2.7.1 The handset is a telephone type with earpiece, mouthpiece, and push-to-talk (PTT) switch. The handset is used during voice communications with the dispatcher and driver public address.

2.7.2 Voice conversation is accomplished by depressing the handset PTT switch and speaking into mouthpiece. Release of the PTT switch allows the operator to listen to the dispatcher.

2.7.3 When the driver public address function is enabled, the operator depresses the handset PTT switch and speaks into mouthpiece to talk with passengers.

2.8 LOCKSWITCH (ON/OFF)

Turning lockswitch key one-quarter turn clockwise applies power to the terminal. To remove power from the terminal, turn the key one-quarter turn counterclockwise.

2.9 POWER ON INDICATOR

The power on indicator (PWR) lights when power is applied to the terminal indicating that the terminal is operable.

2.10 TRANSMIT INDICATOR

2.10.1 The transmit indicator (TX) lights whenever the terminal is transmitting data to the dispatch center computer or when the operator is transmitting voice to the dispatcher.

2.10.2 During an emergency alarm data transmission, the indicator is inoperative.

2.11 ACKNOWLEDGE INDICATOR

2.11.1 The acknowledge indicator (ACK) lights when the terminal receives an acknowledgement (data message) from the dispatch center computer in response to an operator request-to-talk or priority request-to-talk.

2.11.2 In addition to the control panel acknowledge indicator, the terminal emits an audible beep when the acknowledgement is received.

2.11.3 When the terminal receives an alarm reset from the computer, there is no visual or audible notification.

2.12 CALL INDICATOR

2.12.1 The call indicator (CALL) lights when the terminal receives an individual call from the dispatcher. This indicates that the dispatcher desires voice communication with the operator.

2.12.2 In addition to the control panel call indicator, the terminal emits an audible beeping for a five second duration when an individual call is received.

2.12.3 When the terminal receives a group or all call, the control panel call indicator is off and the terminal emits an audible continuous tone for a five second duration.

2.13 DRIVER PUBLIC ADDRESS INDICATOR

The driver public address indicator (PA) lights when the driver public address function is enabled.

3. OPERATING PROCEDURES

3.1 INITIALIZATION

Step 1. Turn the lockswitch, one-quarter turn clockwise, to the 'on' position. Observe that the PWR indicator is on and the LCD displays 000000.

Step 2. Enter the work assignment (ROUTE/RUN) number by depressing the switch directly below the LCD digit to be changed. A momentary depression increments the digit by one. Holding the switch depressed continuously increments the digit. A beep is heard each time the digit increments. Release the switch when the desired digit is displayed.

3.2 VOICE COMMUNICATIONS REQUEST

To indicate to the dispatcher a need for voice communications:

Step 1. Momentarily depress the REQUEST or PRIORITY switch (depending on urgency).

Step 2. Observe that the ACK indicator is on and a beep is heard.

The dispatcher sends an individual call when ready to communicate.

3.3 SELECTIVE CALL

3.3.1 Individual Call

When the terminal receives an individual call, the CALL indicator is on and beeping is heard for 5 seconds. When the beeping stops, the CALL indicator remains on.

Step 1. Pick up the handset. Monitor the channel through the earpiece.

Step 2. When channel is clear, depress the handset push-to-talk switch (PTT). Observe that the CALL indicator is off and TX indicator is on.

Step 3. Speak into handset mouthpiece and verify receipt of call to the dispatcher.

Step 4. Release handset PTT switch and observe TX indicator is off.

Step 5. Listen for the dispatcher's message.

Step 6. Depress handset PTT switch and observe TX indicator is on. Speak into mouthpiece and verify receipt of message (or deliver your message if you requested to talk).

NOTE

If the handset PTT is continuously depressed for more than 30 seconds, a time-out timer (TOT) tone is heard in the earpiece for 4 seconds. If the handset PTT is still depressed after the tone stops, the time-out timer (TOT) implements a PTT release to turn off transmitter. If additional voice communication is necessary, release handset PTT and wait momentarily (no longer than 30 seconds) to depress the PTT switch and resume conversation.

Step 7. Release handset PTT switch.

Step 8. Return handset to the hang-up clip.

3.3.2 Group Or All Call

When the terminal receives a group or all call, a continuous tone is heard for 5 seconds. Pick up the handset and listen to the message. When message is completed, return handset to hang up position.

3.4 DRIVER PUBLIC ADDRESS (OPTION)

To communicate with the vehicle passengers:

Step 1. Depress the Public Address (PA) switch. Observe that the PA indicator is on.

Step 2. Pick up handset.

Step 3. Depress handset PTT switch. Speak into the handset mouthpiece to deliver message.

Step 4. Release the handset PTT switch and return the handset to the hang-up position.

Step 5. Depress the PA switch. Observe that the PA indicator is off.

NOTE

Should a selective call or dispatcher PA message be received by the terminal during driver PA operation, the driver PA is turned off and the proper call indicator is activated.

3.5 EMERGENCY ALARM

A dash mounted alarm switch is installed in the vehicle. Familiarize yourself with the exact location of this switch. In case of an emergency on board the vehicle, depress and release the alarm switch. The terminal transmits (without turning on the TX indicator) an emergency alarm message to the dispatch center. The dispatcher center continues to receive automatic emergency alarms until it is acknowledged (without turning on the ACK indicator).

3.6 FALLBACK OPERATION

3.6.1 In the event of a computer or data channel shut down, the terminal enables the PA speaker. The dispatcher can then have normal two-way voice communication to the vehicle.

3.6.2 To indicate a need for voice communications, follow the instructions outlined in the Voice Communications Requests paragraph.

NOTE

During fallback operation, if the REQUEST or PRIORITY switch is depressed, the ACK indicator does not turn on. The CALL indicator turns on and 5 seconds of beeping is heard. Since the dispatcher PA speaker is enabled during the fallback mode, the driver PA function is disabled.

3.7 OPTIONAL MESSAGE CAPABILITY OPERATION

Terminals equipped with this option have a control panel similar to that shown in Figure 2. Up to five switches (M1, M2, M3, M4, and M5) may be present and are located in the designated positions. The switch function, when activated, sends a message to the dispatcher. The specific message is predefined by the customer and varies from system to system. The following is a general procedure:

Step 1. Depress any of the five message switches. Observe that an audible beep is heard.

Step 2. Observe that a second audible beep is heard. (This indicates message receipt by the computer.)

NOTE

Message capability is inoperative in the fallback mode.

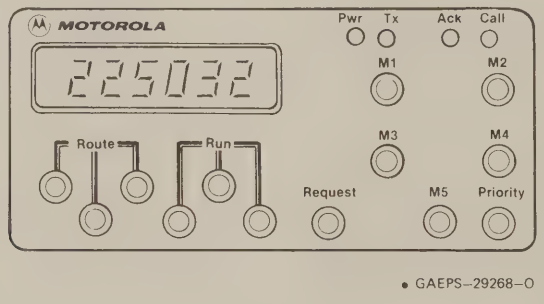


Figure 2. Control Panel With Message Switches

1. GENERAL

1.1 The Theory of Operation provides the experienced technician with a thorough understanding of the mobile data terminal circuits and their functional operation. This information will aid the technician in troubleshooting the equipment.

1.2 The Theory of Operation consists of the following sections:

- Functional Description — provides a comprehensive description, at the block diagram level, of how individual circuit stages collectively function together during various modes of operation.
- Basic Circuit Operation — This section, together with theory notes on the schematic diagram, provides a component level description of the individual circuit(s) which form a circuit stage.
- Mobile Radio Interface Operation — provides a description of interaction between the mobile data terminal and the radio set. This information is useful in isolating a problem to one or the other.
- Positive Ground Operation (Option) — provides a description of positive ground option implementation and positive ground board interface and operation.

2. FUNCTIONAL DESCRIPTION

(Refer to Figure 1 Mobile Data Terminal Block Diagram.)

2.1 INITIALIZATION

2.1.1 When power is applied to the mobile data terminal, initializer circuit U3B generates a low-going 50 msec pulse on the reset line resetting the following circuits to their initial conditions:

- output devices (Hex D-flip flops) U107, U216-U219 outputs are low.
- ROM with I/O U209, Ports A and B assume input mode.
- microcomputer U208 makes a diagnostic check of its program memory and begins processing the control program.

2.1.2 After the microcomputer verifies its program memory to be correct, it performs the output sequence enabling LED driver U107 and the PWR LED turns on. The output sequence is performed five more times enabling the following outputs:

- LCD drivers U101 and U102
- LCD drivers U103 and U104
- LCD drivers U105 and U106
- (Note that the LCD displays all zeroes.)
- U217 which turns buffer Q210 on, disabling dispatcher PA (places radio set into PL squelch mode).
- U219 which turns buffer Q217 on, selecting data channel (F1).

2.1.3 As the microcomputer processes through the control program, it frequently samples the ROM with I/O Ports A and B for input function data. It then operates on this data and provides output data on U208 Ports 1 and 2. The input and output sequence is described as follows:

- Input sequence — The microcomputer U208 places appropriate data on Port 2. Port 2 data is decoded by the input address decoder U214. The input address decoder enables the appropriate input function data (determined by switches and jumpers) to be placed on the Port A bus. Microcomputer U208 addresses ROM

with I/O U209, via address-data bus, for Port A data. Port A data is placed on address-data bus and the microcomputer reads the bus, latching the data into internal RAM (data memory). (Note that Port B function data is not program selectable but is addressed and read in the same manner as Port A).

- Output Sequence — microcomputer U208 places appropriate output function data on Ports 1 and 2. The Port 2 data is decoded by output address decoder U215 which enables (clocks) the proper output device (U107, U216-U219, and U101-U106). Once enabled, the output device latches the Port 1 data.

2.2 VID (WORK ASSIGNMENT) ENTRY (Note that all zeroes in the LCD is not a valid VID.)

The operator enters the VID via front panel switches S1-S6. While S1 is momentarily depressed, the microcomputer performs an input sequence. The microcomputer operates on the input data and performs the following output sequences:

- U216 is enabled once to enable the alert tone oscillator.
- U216 is enabled a second time to disable the alert tone oscillator, (Note that the alert tone oscillator is momentarily enabled and disabled in the same manner each time a front panel switch is depressed.)
- LCD driver U101 and U102 (Port 1 data is such that only U101 outputs are affected) is enabled causing the LCD digit controlled by S1 to increment. If the switch is continuously depressed, the aforementioned input/output sequence is repeated about every half second.

Operation of the other five switches, LCD drivers, and LCD digits is the same as just described.

2.3 FID AND OPTION ENTRY

The microcomputer performs input sequences to obtain the following input function data:

- Position or setting of FID switches (P/O S201 and S202) and option jumpers JU3-JU6.
- Position or setting of FID switches (remainder of S201 and S202).

During normal operation the microprocessor is continually scanning these inputs and compares the ID part of any received message with its own FID.

2.4 DATA COMMUNICATIONS SIGNALING

2.4.1 The mobile data terminal utilizes Minimum Shift Keying (MSK) modulation. The modulating wave is shifted between 1200 Hz and 1800 Hz; mark and space respectively. A single mark equals one cycle at 1200 Hz and a single space equals a cycle and a half at 1800 Hz. When encoding or decoding data, a binary '1' is converted to a mark and a binary '0' is converted to a space.

2.4.2 Data message transmissions, from the computer, are received by the mobile radio on the data channel (F1). The radio set discriminator detects the MSK tones which are applied to the modem input circuits. The modem converts the tones into binary data which is serially applied as an input to the microcomputer (U208). The modem also provides two control signal outputs:

$\overline{\text{DATA DETECT}}$	A continuously low signal indicating that data is detected. When no data is present this output is high.
$\overline{\text{INTERRUPT}}$	A low going pulse on this output indicates any shift from mark to space or vice versa. This output is normally high.

2.5 SELECTIVE CALLING

2.5.1 The dispatcher can selectively call mobiles, when he desires voice communications, by performing any of the following four functions:

- Individual Call with Fixed Identification (FID)
- Individual Call with Variable Identification (VID)
- Group Call using the 2 or 3 MSD's of the VID
- All Call (some functions are not normally used in this mode).

The mobile data terminal processes all four functions in a similar manner. The following paragraphs describe an individual call noting the differences between its functions and those of group/all calls.

2.5.2 The dispatcher transmits an individual call to a mobile terminal using the terminal FID or VID.

2.5.3 The mobile data terminal microcomputer receives the serial data input from the modem. The data contains ID, function, and parity bits. The microcomputer decodes and processes the data. Part of the data contains information about the ID. If the microcomputer realizes that the message is addressed by Fixed ID or Variable ID it then compares the received ID with the mobile FID (inputted from internal switches S201 and S202) or VID (inputted from front panel switches S1-S6) respectively. (Group call compares 2 or 3 MSD's of the VID. All calls have no ID comparison.)

2.5.4 Once comparison is verified, the function (individual call) provides output sequences from U208 enabling the following:

- U216 which enables alert tone oscillator for a 5 second intermittent audible tone output. (For group/all calls a 5 second continuous audible tone is enabled by U216.)
- LED driver U107 which turns on the CALL LED and turns off the ACK LED if it was on. (Not applicable for group/all calls.)
- U216 which turns on PTT switch Q205 (puts low on radio PTT line keying the transmitter) and turns off data voice switching Q231 and K201 (applying encoded data output to radio xmit audio input).

The terminal serially outputs the FID which is sent to the computer as acknowledgement. After acknowledgement is sent, U208 performs an output sequence enabling flip-flop U216 which turns off PTT switch Q205 and subsequently the radio transmitter.

2.5.5 The mobile operator, having been signaled to call in, removes the handset and depresses the handset PTT switch providing a low on one input of the Port B bus. The microcomputer performs an input sequence, then performs output sequences enabling the following:

- U219 or U218 which selects the assigned voice channel.
- U107 which turns on the TX LED and turns off the CALL LED.
- U216 which turns on PTT switch Q205 (keying transmitter).

The microcomputer serially outputs the FID which is encoded and transmitted to the computer on the assigned voice channel.

2.5.6 The microcomputer performs an output sequence enabling U216 which turns on data/voice switching Q231 and K201, connecting handset mic audio to the radio xmit audio input for voice modulation (and disables the alert tone oscillator if it is still enabled).

2.5.7 If the handset PTT is held depressed for more than 30 seconds, the TOT (time-out timer) portion of the control program times out causing U208 to perform output sequences enabling the following:

- U216 which turns off PTT switch Q205 (transmitter off) and turns TOT tone mute switch Q225 on for 4 seconds allowing TOT oscillator U206 B and C tone output to be heard in the handset earpiece.
- U107 which turns off the TX LED.

At the end of the four second tone, another output sequence is performed enabling U216 which turns on TOT tone mute switch Q225 inhibiting TOT tone.

NOTE

If the handset PTT switch is released and again depressed during the next 60 seconds, the driver can continue conversation for another 30 seconds.

2.5.8 Whenever handset PTT is released, the microcomputer senses this by performing an input sequence and transmits VID. In addition, the voice channel timer portion of the control program is activated. If the handset PTT is released for more than 60 seconds the voice channel timer times out and the microcomputer performs output sequences enabling the following:

- U217 which causes earpiece disable circuit U210B to activate handset squelch circuit U232C muting handset earpiece audio.
- U219 which selects the data channel (F1).

2.6 REQUEST (REQUEST-TO-TALK)

2.6.1 The operator depresses REQUEST switch S7. While the switch is depressed, the microcomputer performs an input sequence and the message bit is stored in RAM. When the mobile is polled, the microcomputer performs output sequences keying the transmitter and turning the XMIT LED on. The request-to-talk (RTT) bit is set in a message, along with VID (or FID), that is serially applied to the radio xmit audio input to be modulated. Once the message has been sent, the TX LED is turned off and the transmitter is dekeyed.

2.6.2 Once the computer has received the RTT and FID, an acknowledgement message is returned to the terminal. When received, the microcomputer processes the serial input data and performs output sequences enabling U107 which turns the ACK LED on and U216 which enables a half second ACK tone. A short time later the dispatcher selectively calls the mobile to enable voice communications.

2.7 PRIORITY (PRIORITY REQUEST-TO-TALK)

Priority request-to-talk function is similar to request-to-talk operation except for the following:

- front panel switch S8 is depressed to activate the function.
- priority function message bit and VID (or FID) is transmitted immediately on the primary voice channel. The terminal then reverts the radio to the data channel awaiting acknowledgement.

2.8 OPTIONAL MESSAGE CAPABILITY

Up to five predefined messages can be activated by depressing front panel switches S9 or S11-S14. Functional operation is the same as that described for the request function except for the following:

- The ACK LED does not turn on. The acknowledge indication is a .5 second audible alert tone.
- Function is not used for voice communication requests.

2.9 MECHANICAL ALARMS

2.9.1 Mechanical alarm inputs (six are provided) can be used to monitor various sensors on the vehicle such as air pressure, oil pressure,etc. In all cases Mechanical Alarm 1 is the air pressure alarm.

2.9.2 All mechanical alarm inputs are active low (less than .8 V). Mechanical alarm disable input, when high, disables all Mechanical Alarm functions except Mechanical Alarm 2.

2.9.3 All mechanical alarm sensors are applied to opto-isolators which invert and isolate the sensor output. Mechanical Alarm 2-6 data is applied to ROM and I/O U209 Port A bus when the microcomputer performs an input sequence which turns on buffer enable switch Q223 enabling three state buffer U211. Mechanical Alarm 1 and mechanical alarm disable data is applied to two inputs of the Port B bus. The microcomputer reads the data present at the Port A and B buses into RAM.

2.9.4 Of all the mechanical alarms only Mechanical Alarm 1 has a prerequisite. In this case the air pressure must have been normal and then drop below normal for at least 20 seconds. Mechanical Alarm 2 has a 5-second debounce delay before becoming a valid alarm. Mechanical Alarms 3 through 6 have 20-second debounce delays before becoming valid alarms.

2.10 EMERGENCY ALARM

2.10.1 The emergency alarm input is controlled by an externally mounted switch. The normal (no alarm condition) input from this switch is a logic low (ground) applied to opto-isolator U227. During the no alarm state the opto-isolator places a low on one input of U209 Port B bus.

2.10.2 In order to test the emergency alarm circuits without interrupting the local operator, the dispatcher sends E.A. Test function to a particular mobile unit using the mobile unit FID or VID for addressing. When this function is received by the mobile, the microcomputer decodes and processes the data, comparing it with the VID or FID of the mobile unit.

2.10.3 Once comparison is verified, the function (E.A. Test) causes the microcomputer to perform an output sequence enabling U216 which causes the E.A. Test input to be high. A high on the E.A. Test input (or a momentary open in the emergency alarm switch) causes opto-isolator U227 to place a high on one input of the Port B bus (alarm condition). The microcomputer reads the Port B bus data into RAM. The microcomputer performs output sequences enabling the following:

- U218 or U219 is enabled to select the primary voice channel.
- U216 is enabled which turns on PTT switch Q205 (keying the transmitter) and turns off data/voice switching Q231 and K201 (encoded data to radio xmit audio input). Note that the TX LED is not turned on.

The microcomputer serially applies FID along with the E.A. (emergency alarm) bit to encode filter U201B and encoded data is transmitted to the dispatch center. After the transmission, the microcomputer performs output sequences which turn off the transmitter and revert the radio to the data channel (F1) to await receipt of alarm off function.

2.10.4 On receipt of the alarm off function from the computer, the microcomputer performs an output sequence enabling U216 which causes a low to be placed on the E.A. Test input. Opto-isolator U227 output goes low (no alarm condition). The E.A. bit is cleared.

2.11 DRIVER PA

2.11.1 To initiate this function the operator momentarily depresses front panel PA switch S10. The microcomputer performs an input sequence obtaining

the input function data. The microcomputer operates on the data and performs output sequences enabling the following:

- U107 which turns on the PA LED.
- U217 which turns on Q232 and K202 connecting handset mic audio to the radio (PA mic audio input).

2.11.2 When the PA switch is depressed again, the previously described input/output sequence occurs, but the PA LED is turned off and so are Q232 and K202. The PA function is now deactivated.

2.12 DISPATCHER PA

2.12.1 The mobile unit receives a dispatcher PA On function data transmission from the computer. The modem serially applies the function and FID (or VID) data to the microcomputer. The microcomputer verifies proper ID and processes the function by performing an output sequence enabling U217 which turns on Q210 applying a high output on the radio PL select input (carrier squelch mode). This enables the dispatcher PA function.

2.12.2 To disable the function, the dispatcher executes a clear communications command. The microcomputer enables U217 which turns off Q210 applying a low output on the PL select input (PL squelch mode).

2.13 FALLBACK MODE

2.13.1 In the event of a computer or data channel shutdown, the mobile data terminal senses the lack of data message input and enters the fallback mode. In this mode, simulated selective calls from the dispatcher occur whenever request-to-talk or priority request-to-talk functions are activated. The following events occur: the dispatcher PA function is enabled providing receive audio in the PA speaker, handset PTT is enabled, and driver PA function is disabled.

2.13.2 The microcomputer is checking data received, via the modem. If a valid message is not decoded every 30 seconds, the fallback timer (part of control program) times out reverting the terminal to the fallback mode. The microcomputer performs an output sequence enabling U217 which turns on Q210 putting a high on the radio PL select input (carrier squelch mode) and turns off Q232 and K202 (driver PA disabled).

2.13.3 If dispatcher desires voice communications, he voice calls the mobile over the data channel. (All mobiles hear the voice message.) If the local operator desires voice communications, he depresses either REQUEST or PRIORITY front panel switches. The microcomputer performs an input sequence obtaining the input function data. It then performs output sequences enabling the following:

- U107 which turns on the CALL LED.
- U216 which enables the intermittent audible alert tone. (At the end of 5 seconds another output sequence is performed to disable the alert tone oscillator if it is not already disabled by handset PTT.)
- U218 or U219 which selects the primary voice channel.

Remainder of operation is the same as described in Selective Calling paragraphs.

2.13.4 Should an Emergency Alarm switch be activated while the mobile data terminal is in the 'Fallback Mode', the emergency alarm is still transmitted. Every six seconds, the alarm burst is transmitted on the voice channel. (Burst varies from 2.2 to 3.0 seconds depending on ID, and consists of 6 messages.) When the terminal is not transmitting an emergency alarm, it returns the radio to the data channel awaiting receipt of an alarm off command. This cycle is repeated for approximately 1.5 minutes or until an alarm off command is received.

2.14 DASYS INTERFACE

2.14.1 Description

This interface accommodates high speed data transfer between the mobile data terminal and peripheral units, i.e. Location Processing Unit.

2.14.2 General Operation

The mobile is polled with a peripheral request. This request is answered automatically without assistance from the mobile operator.

NOTE

The peripheral request contains functions such as location, previous signpost, etc. These functions are basically the same; therefore, only the Location Request is described.

2.14.3 Location Request Operation

2.14.3.1 When the mobile unit is polled with a Peripheral Data Request function, the microcomputer performs output sequences enabling the following:

- U216 which turns on PTT switch Q205 (keying the transmitter).
- U107 which turns on TX LED.
- U217 which produces a monitor address output via monitor address buffers Q207 through Q209 (this addresses the Location Processing Unit).

2.14.3.2 The location processing unit (LPU-1200) provides a monitor ready signal input to the three state buffer U229. The microcomputer performs an input sequence which turns on buffer enable switch Q223 which enables U229 placing the monitor ready signal on one input of U209 Port A bus. The microcomputer reads the Port A data, operates on it, and generates a monitor clock output, via monitor clock buffer Q204, to the location processing unit. At the same time, the microcomputer performs an input sequence for Port B data. The monitor clock output clocks the location data out of the location processing unit. The location data is serially applied to one input of the Port B bus. This data is stored in internal RAM of U208.

2.14.3.3 The microcomputer serially applies the location data to the encode filter U201B which applies encoded data, via data/voice switching Q231 and K201, to the radio xmit audio input. The data is transmittted to the dispatch center computer.

2.14.3.4 After the location data is transmitted, the microcomputer program then removes PTT and the location unit address, turns off the TX LED, and reverts back to the normal state (awaiting the next function).

3. BASIC CIRCUITS OPERATION

(Refer to Mobile Data Terminal Schematic Diagram.)

3.1 MICROCOMPUTER/ROM and I/O EXPANDER

3.1.1 The microcomputer U208 is the heart of the mobile data terminal. It is an 8-bit device containing system timing, control logic, ROM (program memory), RAM (data memory), and I/O lines. The normal memory and I/O capacities are as follows.

- ROM array 1 kbytes x 8
- RAM array 64 bytes x 8
- 24 I/O lines

3.1.2 The microcomputer is interfaced with ROM and I/O expander U209, which increases the microcomputer system ROM capacity to 3 kbytes. The mobile data terminal control program is stored in ROM. Program memory with addresses less than 1024_{10} are stored in U208 ROM, while those greater than 1024_{10} are stored in U209 ROM. In addition, to ROM expansion, U209 expands the input capacity of U208 by adding 8 input lines.

3.1.3 Expansion control is performed by U208, operating under the control program. As the microcomputer processes the program, it frequently addresses U209. The U208 address output, in conjunction with control signals, determines whether U209 transfers data from ROM (program memory), Port A (PA0-PA7), or Port B (PB0-PB7). The expansion control sequence is as follows:

- An 11-bit address is output from U208 (internal program counter). The least significant 8 bits on the data bus (DB0-DB7) and the most significant 3 bits on the lower half of Port 2 (P20-P22).

- The address latch enable (ALE) signal goes high, indicating an address output from U208 to U209 (AD0-AD7 and A8-A10). When ALE goes low (trailing edge), the address is latched into U209. (ALE signal is an output from U208 and is always present. It is a non-symmetrical square wave with a frequency approximately equal to crystal frequency divided by 15.)

- For external program memory fetch - U208 program store enable ($\overline{\text{PSEN}}$) signal goes low enabling the external ROM. ROM and I/O expander U209 places the contents of the addressed memory location on the data bus. $\overline{\text{PSEN}}$ goes high (rising edge), internally latching the data bus information into U208. ($\overline{\text{PSEN}}$ signal is only present during an external memory fetch.)

- For external input port data read - U208 read ($\overline{\text{RD}}$) signal goes low enabling one of the input ports of U209. (Port A is enabled if U209 address line AD0 '0'; Port B is enabled if AD0 '1'.) The information on the enabled port is placed on the data bus. $\overline{\text{RD}}$ goes high (rising edge) internally latching the data bus information into U208. ($\overline{\text{RD}}$ signal is only present dur ing an external input port data read.)

- The data bus goes 3-state (high impedance) and U208 operates on the latched data.

3.1.4 Prior to addressing U209 for Port A data, U208, under program control, places data output on P24-P27 (part of Port 2). These output lines are applied to input address decoder U214 and output address decoder U215. Input address decoder U214 decodes the output data and selects the appropriate input function data (determined by switches and jumpers) to be placed on Port A. The input function data present on U209 Port B is not program selectable. After operating on the data received from ROM, Port A, or Port B, U208 places output data on P24-P27 (part of port 2) and on P10-P17 (Port 1). The P10-P17 data is applied to data inputs of output devices (LCD drivers U101-U106 and hex D-flip flops U107 and U216-219). The P24- P27 data is decoded by U215 which selects the appropriate output device to be clocked (U215 is disabled when P27 is high.) Just after the data is placed on the ports, U208 write ($\overline{\text{WR}}$) signal goes low (falling edge) clocking the selected output device.

3.1.5 There are several timer functions that are controlled by the microcomputer program. These timer functions are listed and briefly described in Table 1.

Table 1.
Microcomputer Program Timers and Functions

Timer	Function
FALLBACK	The microcomputer is checking data received via the modem and if a valid message is not decoded for 30 seconds, the mobile unit reverts to the fallback mode.
TIME-OUT-TIMER (TOT)	If the transmitter is continuously turned on for 30 seconds, this timer implements a PTT release and gates a TOT tone into the earpiece for 4 seconds, and reverts the unit to controlled data channel.
ALERT TONE TIMER	Timer started by receipt of CALL function. Allows alert tone to sound for approximately five seconds.
START OF RUN (OPTION)	Timer started by receipt of START OF RUN function for a duration five seconds. An optional buzzer is controlled by this timer.
ALARM CYCLE TIMER	The alarm cycle counter is activated by an E.A. while the unit is in the Fallback mode only. It times a six-second period after the alarm and FID is repeatedly transmitted seven times (for approximately 1.5 minutes) on voice channel.
VOICE CHANNEL TIMER	Timer is activated when handset PTT is released. Resets if handset PTT is depressed within 60 seconds of time it was released. When it times out, program switches unit to data channel, disables handset PTT, mutes earpiece audio, and starts Fallback timer.

3.2 MODEM

3.2.1 The mobile radio discriminator output is applied to 1200-1800 Hz bandpass filter U201C and U201D. These two filter sections insure that only tones in the 1200 Hz to 1800 Hz range are passed. The tone decoding is such that data output depends upon tone input; a 1200 Hz tone equals a '1', and an 1800 Hz tone equals a '0'. The filtered tones pass through limiter U201A and are applied as a series of square waves to phase comparator (exclusive OR gate) U205C. At 1500 Hz (VCO center frequency), the inputs to the phase comparator (exclusive OR) are 90 degrees out-of-phase and produce a particular dc reference voltage at U204-5. If the input frequency is 1200 Hz the voltage at U204-5 rises above the reference. Conversely, if the input frequency is 1800 Hz, the voltage at U204-5 falls below the reference. This results in a frequency sensitive signal being applied to U202C and to U202A.

3.2.2 U202C together with R317, R318, R319, C247 and C248 form a bandpass filter centered around 1200 Hz. When data is not received the noise level on the output of U202C-8 raises the average voltage level on the cathode of CR210. This keeps the output of U202B-7 low and consequently U209-38 is high. When data is received, the noise that kept U202C-8 high is suppressed. Capacitor C250 discharges through R321 and R320 eventually causing U202B-7 to go high causing U209-38 to go low. The delay between the moment data is detected and the output of U206A-2 goes low is adjusted by R322. The nominal value is 35 ms.

3.2.3 When a data signal is present, the U204-5 signal applied to U202C passes through U202B to produce a low $\overline{\text{DATA DETECT}}$ signal at U209-38 (one of the Port B inputs to U209) to indicate that valid data is being detected.

3.2.4 The U204-5 signal is also applied to U202A, a 600 Hz low-pass filter. The voltage-reference dc signal is passed through U202A and appears as an analog signal swinging above and below the dc reference. The dc reference charges C235 to a dc level which is used as a comparison voltage at U202D-13. The resultant data bits at U202D-14 are buffered by two Schmitt trigger-inverters before being applied as serial data to the microcomputer (U208-1; TO).

3.2.5 The inverted data bits present at U206F-12 are applied to exclusive OR gate U205D. As the data bits transition from one state to another, U205D-13 input changes accordingly while U205D-12 input transition is delayed (due to C239). This momentarily results in two opposite state inputs to exclusive OR gate U205D which provides a high output, triggering Schmitt Trigger U206D-8 to a low. This low is applied to microcomputer U208-6 ($\overline{\text{INT}}$) enabling an interrupt in the microcomputer program.

3.3 RESET CIRCUITS

The following circuits control the state of the reset line.

3.3.1 Initializer

The power-up reset is generated by the initializer circuit when power is initially applied. The +5 V is applied to both pin 4 and pin 5 of U3B; however, C10 delays the application to pin 5. This results in a low-level reset pulse (approximately 50 ms) being applied to the reset line, resetting the various circuits connected to the reset line.

3.3.2 Microcomputer Activity Checker/Reset Timer

The microcomputer activity checker circuit, U210F and Q201, monitors input address decoder U214-14 for positive pulses which are a result of microcomputer control of the input address decoder A, B, C inputs. Each positive pulse is applied to buffer U210F-12 which provides a high output causing Q201 to conduct, holding C221 in a discharged condition. If there is no microcomputer activity, the positive pulses cease and Q201 turns off. With Q201 off, reset timer capacitor C221 begins to charge. At the end of approximately 6 seconds, C221 has charged sufficiently to trigger reset timer Schmitt Trigger U207A-2 low which forward biases CR215 providing a low on the reset line.

3.4 POWER FAIL DETECT

3.4.1 The power fail detect circuit input, U3A-7, senses the filtered 13.6 V input for a transient interruption of power. During a power interrupt, U3A-7 goes low while U3A-6 remains constant, due to C7, resulting in a low going pulse at U3A-1. This low going pulse is applied to microcomputer U208-39 (T1) input causing an interrupt in the control program. Program data that it was operating on is stored in RAM and the microcomputer branches to a subroutine. Operating under the subroutine, the microcomputer places binary data on Port 1 (P10-P17) output bus to the output devices (hex D flip flops). Then it places binary data on Port 2 (P24-P27) bus which causes the Port 1 data to be clocked into U216 and U217. This provides lows on U216-12 and 7 and a high on U217-7 which disables radio transmitter, alert tone oscillator, and dispatcher PA respectively. This prevents improper operation of these functions during a power interrupt.

3.4.2 After the transient power interrupt is gone, U3A-7 goes back high causing U208-39 (T1) input to transition high. The microcomputer resumes operation of the control program at point where the branch to subroutine occurred.

3.5 +9 V REGULATOR

The +9 V regulator consists of series pass transistor Q202 and drive transistor Q203. When +5 V (used as a reference voltage) is applied to Q203 base, Q203 conducts supplying drive to Q202 causing it to conduct providing an output voltage at Q202 collector. The output voltage is connected across voltage divider R315, CR209, CR219, and R316 to provide an output sample voltage to Q203 emitter. If the +9 V output increases, the sample voltage increases causing Q203 to conduct less, reducing drive to Q202 causing it to conduct less reducing the output voltage to +9 V. If the +9 V output voltage decreases, Q203 and Q202 conduct more increasing output voltage to +9 V.

3.6 BACKPLANE OSCILLATOR

Backplane oscillator U207D is a free-running oscillator that is applied to the LCD. The oscillator frequency is between 60 and 500 Hz and provides a steady non-flickering display readout.

3.7 HANDSET AUDIO/SQUELCH

3.7.1 The radio discriminator output is applied via J203-12 to handset volume control R374 and to handset squelch control R267.

3.7.2 The handset squelch circuit is noise operated. With no carrier signal received, handset squelch control sets the level of discriminator noise applied to noise detector U232F-13. The noise detector detects and inverts the positive noise transitions, providing negative going pulses which are applied to the integrator input U232E-11. The integrator inverts and averages the negative pulses providing a high dc average voltage output. This high output triggers Schmitt Trigger U232D and C so that U232C-6 is high. This high output forward biases CR203 placing handset amplifiers U232A and B in saturation causing U232-2 and 4 to go to ground potential disabling handset audio.

3.7.3 With an on-frequency carrier received, discriminator noise is reduced significantly. The noise detector has no output and integrator U232E-11 is pulled high through CR221, CR222, R271, and R218 causing U232E-10 to go low. This low causes U232C-6 to go low reverse biasing CR203, enabling handset amplifiers U232A and B. Handset volume control R374 sets the level of discriminator audio applied to the handset amplifiers and consequently the audio output level applied to the handset earpiece.

3.8 TOT TONE OSCILLATOR

TOT (time-out timer) tone oscillator U206B is a free-running oscillator which applies a tone signal (via U206C) to the handset amplifier. Although the oscillator is always on, TOT tone mute switch Q225 clamps the junction of R277, R379, and R343 to ground under normal conditions. However, if the time-out timer times out, Q225 is turned off and the tone is applied to handset amplifiers and is present in the earpiece.

3.9 ALERT TONE OSCILLATOR

3.9.1 The alert tone oscillator circuit produces either a continuous or intermittent audible tone and is controlled by U216 outputs.

3.9.2 Assuming that U216 was just reset, U216-5 is low. This low output forward biases CR212 pulling U207E-11 low, causing U207E-10 to go high. Diode CR213 is reversed biased and U207-F oscillates providing a 2.5 KHz square wave output at U207F-12.

3.9.3 With a low on U216-2, CR214 is forward biased clamping the base of Q206 low keeping it cutoff. When U216-2 goes high, CR214 is reverse biased and the 2.5 KHz square wave output of U207F-12 is applied to Q206 base. Transistor Q206 inverts the square wave and drives the speaker LS201 and a continuous tone is heard.

3.9.4 When U216-5 goes high, CR212 is reverse biased and U207E oscillates at 2.5 Hz. The 2.5 Hz square wave output of U207E-10 is applied to CR213. The negative portion of the square wave forward biases CR213 inhibiting U207F oscillation. The positive portion of the square wave reverse biases CR213 enabling oscillations. This results in an intermittent tone being produced in the speaker.

3.10 ENCODE FILTER

The serial data output present at U208-33 is applied to the encode filter U201B and associated circuitry. The encode filter is a low-pass filter which integrates the data transitions (converts the digital signal to an analog signal) for application to the radio set xmit audio input.

4. MOBILE RADIO INTERFACE

4.1 GENERAL

The mobile data terminal is electrically connected to the radio receive audio circuits, transmit audio input, and various function control lines. The interface is described in the following paragraphs.

4.2 RECEIVE AUDIO CIRCUITS

The radio set discriminator output is applied to the following logic unit circuits:

- Modem — monitors discriminator output for MSK tones.
- Handset Audio/Squelch — handset volume and squelch controls.
- PA Volume and Squelch Controls — merely replaces the radio set control head volume and squelch controls. (PA audio amplification and squelch operation is provided by the radio set audio/squelch circuits.)

NOTE

All volume and squelch controls are internal. These controls are preset and are not operator accessible.

4.3 TRANSMIT AUDIO INPUT

The mobile data terminal controls the type of information to be modulated on the transmit rf carrier. It selects either encoded data or voice audio to be applied to the radio xmit audio input. In addition, radio continuous +9.6 V supplies mic bias to the handset via the xmit audio line.

4.4 RADIO FUNCTION CONTROL

The following is a list of radio functions that are controlled by the terminal.

- Frequency Selection — Terminal selects transmit and receive operating frequencies by placing an active low on the appropriate (F) select line (J203-4 through J203-11).
- PL Select (Dispatcher PA) — Terminal selects the type of receive carrier signal required to unsquelch the PA speaker audio. An active low (ground) on the PL select (dispatcher PA) line places the radio in the PL squelch mode. In this mode, a receive carrier encoded with the proper PL code must be decoded by the radio to unsquelch the speaker audio.

A high (open ground) on the PL select line places the radio in the carrier squelch mode. In this mode, any on-frequency receive carrier unsquelches the speaker audio.

NOTE

Depending on system requirements, radios may or may not be equipped with PL decode capability.

- Transmitter Keying — Terminal activates the radio transmitter by placing an active low (ground) on the radio PTT line.

4.5 DRIVER PA (OPTION)

The terminal applies adjusted handset mic audio to the radio TOT alert tone input of the audio/squelch circuits. The TOT alert tone input bypasses the radio squelch circuits.

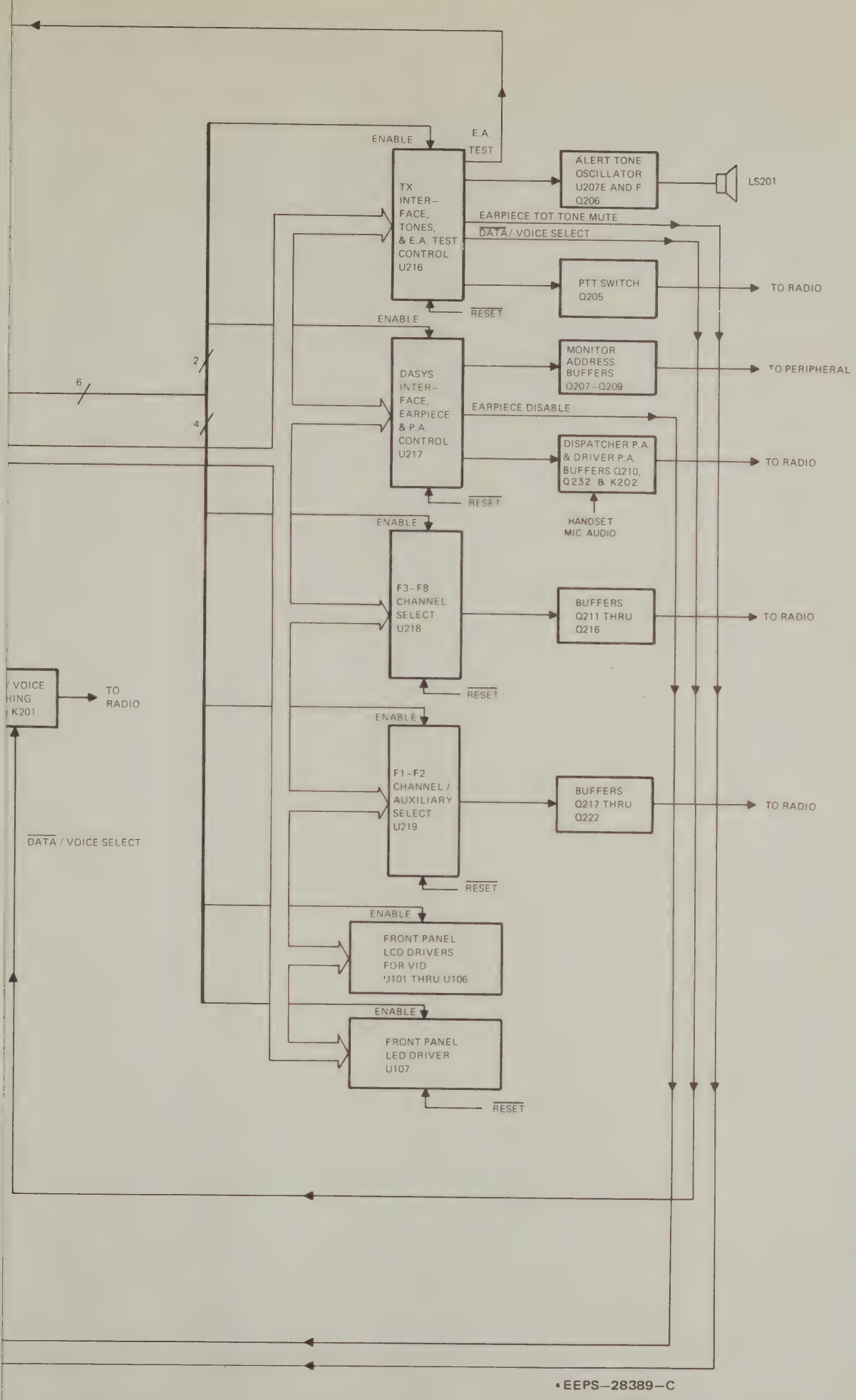
5. RADIO POSITIVE GROUND (OPTION)

(Refer to Mobile Data Terminal Schematic Diagram, TRN4239A Positive Ground Board Schematic Diagram, and Mobile Data Terminal Interconnect Diagrams.)

5.1 Frequency selection, PTT, or dispatcher PA is selected by applying a ground circuit to the radio by means of a transistor switch in the logic unit. These transistor switches are designed for operation from a negative chassis ground. In a positive ground system, it is necessary to re-configure this switching circuitry and isolate the audio reference lines.

5.2 The TRN4239A Positive Ground Board contains 10 relays to allow positive radio ground switching. One end of each relay coil is connected to a switching transistor (Q205, and Q210 thru Q218) in the logic unit. When a function is selected, the relay closes and provides a positive radio ground to the radio control lines.

5.3 The TRN4239A Positive Ground Board also contains an audio transformer (T301) which isolates the discriminator ground reference (radio chassis A +) from the handset audio ground reference (logic unit ground A −). This isolation is needed to prevent an audible alternator whine in the earpiece.


ENABLE
E.A. TEST
TX INTER-FACE, TONES, & E.A. TEST CONTROL U216
ALERT TONE OSCILLATOR U207E AND F Q206
LS201
EARPIECE TOT TONE MUTE
DATA / VOICE SELECT
PTT SWITCH Q205
TO RADIO
RESET
ENABLE
DASYS INTER-FACE, EARPIECE & P.A. CONTROL U217
MONITOR ADDRESS BUFFERS Q207-Q209
TO PERIPHERAL
2
6
4
EARPIECE DISABLE
DISPATCHER P.A. & DRIVER P.A. BUFFERS Q210, Q232 & K202
TO RADIO
RESET
HANDSET MIC AUDIO
ENABLE
F3-F8 CHANNEL SELECT U218
BUFFERS Q211 THRU Q216
TO RADIO
RESET
/ VOICE HING K201
TO RADIO
ENABLE
F1-F2 CHANNEL / AUXILIARY SELECT U219
BUFFERS Q217 THRU Q222
TO RADIO
DATA / VOICE SELECT
RESET
ENABLE
FRONT PANEL LCD DRIVERS FOR VID U101 THRU U106
ENABLE
FRONT PANEL LED DRIVER U107
RESET

•EEPS-28389-C

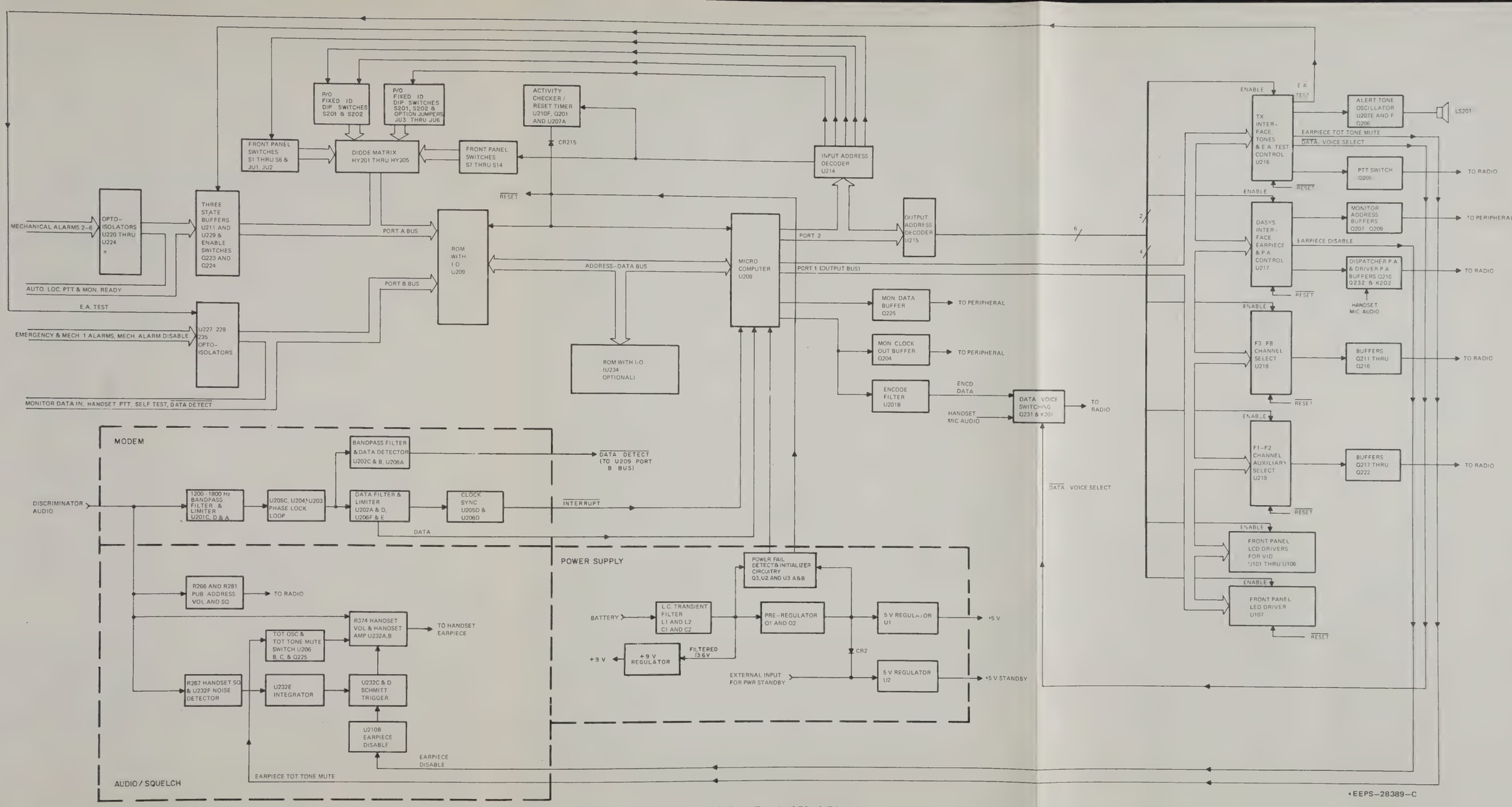

P/O FIXED ID DIP SWITCHES S201 & S202
P/O FIXED ID DIP SWITCHES S201, S202 & OPTION JUMPERS JU3 THRU JU6
ACTIVITY CHECKER / RESET TIMER U210F, Q201 AND U207A
CR215
FRONT PANEL SWITCHES S1 THRU S6 & JU1, JU2
DIODE MATRIX HY201 THRU HY205
FRONT PANEL SWITCHES S7 THRU S14
INPUT ADDRESS DECODER U214
RESET
MECHANICAL ALARMS 2–6
OPTO-ISOLATORS U220 THRU U224
THREE STATE BUFFERS U211 AND U229 & ENABLE SWITCHES Q223 AND Q224
PORT A BUS
PORT B BUS
ROM WITH I/O U209
ADDRESS-DATA BUS
MICRO COMPUTER U208
PORT 2
PORT 1 (OUTPUT BUS)
OUTPUT ADDRESS DECODER U215
AUTO. LOC. PTT & MON. READY
E.A. TEST
EMERGENCY & MECH. 1 ALARMS, MECH. ALARM DISABLE
U227, 228, 235 OPTO-ISOLATORS
MONITOR DATA IN, HANDSET PTT, SELF TEST, DATA DETECT
ROM WITH I/O (U234 OPTIONAL)
MON. DATA BUFFER Q226
TO PERIPHERAL
MON. CLOCK OUT BUFFER Q204
TO PERIPHERAL
ENCODE FILTER U201B
ENCD DATA
HANDSET MIC AUDIO
DATA VOICE SWITCHING Q231 & K201
TO RADIO
DATA VOICE SELECT
MODEM
BANDPASS FILTER & DATA DETECTOR U202C & B, U206A
DATA DETECT (TO U209 PORT B BUS)
DISCRIMINATOR AUDIO
1200-1800 Hz BANDPASS FILTER & LIMITER U201C, D & A
U205C, U204, U203 PHASE LOCK LOOP
DATA FILTER & LIMITER U202A & D, U206F & E
CLOCK SYNC U205D & U206D
INTERRUPT
DATA
R266 AND R281 PUB. ADDRESS VOL AND SQ
TO RADIO
R374 HANDSET VOL & HANDSET AMP U232A,B
TO HANDSET EARPIECE
TOT OSC & TOT TONE MUTE SWITCH U206 B, C, & Q225
R267 HANDSET SQ & U232F NOISE DETECTOR
U232E INTEGRATOR
U232C & D SCHMITT TRIGGER
U210B EARPIECE DISABLE
EARPIECE DISABLE
EARPIECE TOT TONE MUTE
AUDIO / SQUELCH
POWER SUPPLY
POWER FAIL DETECT & INITIALIZER CIRCUITRY Q3, U2 AND U3 A&B
BATTERY
L.C. TRANSIENT FILTER L1 AND L2 C1 AND C2
PRE-REGULATOR Q1 AND Q2
5 V REGULATOR U1
+5 V
+9 V
+9 V REGULATOR
FILTERED 13.6 V
CR2
EXTERNAL INPUT FOR PWR STANDBY
5 V REGULATOR U2
+5 V STANDBY
ENABLE
E.A. TEST
TX INTERFACE, TONES & E.A. TEST CONTROL U216
ALERT TONE OSCILLATOR U207E AND F Q206
LS201
EARPIECE TOT TONE MUTE
DATA VOICE SELECT
PTT SWITCH Q205
TO RADIO
DASYS INTERFACE EARPIECE & P.A. CONTROL U217
MONITOR ADDRESS BUFFERS Q207, Q209
TO PERIPHERAL
EARPIECE DISABLE
DISPATCHER P.A. & DRIVER P.A. BUFFERS Q210, Q232 & K202
TO RADIO
HANDSET MIC AUDIO
F3-F8 CHANNEL SELECT U218
BUFFERS Q211 THRU Q216
TO RADIO
F1-F2 CHANNEL AUXILIARY SELECT U219
BUFFERS Q217 THRU Q222
TO RADIO
FRONT PANEL LCD DRIVERS FOR VID U101 THRU U106
FRONT PANEL LED DRIVER U107

Figure 1. Mobile Data Terminal Block Diagram

•EEPS-28389-C

MOTOROLA INC.
Communications
Sector

SAFE HANDLING OF CMOS INTEGRATED CIRCUIT DEVICES

Many of the integrated circuit devices used in communications equipment are of the CMOS (Complementary Metal Oxide Semiconductor) type. Because of their high open circuit impedance, CMOS ICs are vulnerable to damage from static charges. Care must be taken in handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS IC inputs, the protection is effective only against overvoltage in the hundreds of volts range such as are encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. *However, CMOS circuits can be damaged by improper handling of the modules even in a system.*

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions.

1. Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch *both* hands to a bare metal earth grounded surface. This will discharge any static charge which may have accumulated on the person doing the servicing.

NOTE

Wearing Conductive Wrist Strap (Motorola No. RSX-4015A) will minimize static buildup during servicing.

WARNING

When wearing Conductive Wrist Strap, be careful near sources of high voltage. The good ground provided by the wrist strap will also increase the danger of lethal shock from accidentially touching high voltage sources.

2. Whenever possible, avoid touching any electrically conductive parts of the circuit module with your hands.

3. Normally, circuit modules can be inserted or removed with power applied to the unit. However, check the INSTALLATION and MAINTENANCE sections of the manual as well as the module schematic diagram to insure there are no objections to this practice.

4. When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static buildup.

5. All electrically powered test equipment should be grounded. *Apply* the *ground lead* from the test equipment to the circuit module *before* connecting the *test probe*. Similarly, *disconnect* the *test probe prior* to removing the *ground lead.*

6. If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) which is connected to ground through 100k of resistance.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil at the same time as other electrical circuits.

7. When soldering, be sure the soldering iron is grounded.

8. Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static buildup as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.

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9. When replacing a CMOS integrated circuit device, leave the device in its metal rail container or conductive foam until it is to be inserted into the printed circuit module.

10. All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.

11. Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a simlar material (aluminum foil may be used). NEVER USE NON-CONDUCTIVE MATERIAL for packaging these modules.

1. INTRODUCTION

This section provides maintenance and troubleshooting information for the MCT-1200 and *Metrocom II* Mobile Communications Terminal. This information consists of test, adjustment, and troubleshooting procedures. Also included are troubleshooting charts, interconnect cabling diagrams, schematic diagrams, circuit board details, and parts lists. This information will aid the technician in isolating and repairing a fault down to a component level. The technician should also refer to the Installation section of this manual for disassembly/assembly details and jumper, switch, and component locations. Before performing any detailed troubleshooting, the technician should read the Theory of Operation section of this manual to get a thorough understanding of the circuits and their functional operation.

2. RECOMMENDED TEST EQUIPMENT

The following test equipment is recommended for servicing the MCT-1200 and *Metrocom II* Mobile Communications Terminal.

- Logic Probe (Hewlett-Packard Model 10525A or equivalent)
- Audio Oscillator (Motorola Model S1067 or equivalent)
- AC Voltmeter (Motorola Model S1053 or equivalent)
- DC Multimeter (Motorola Model S1063 or equivalent)
- Frequency Counter (Motorola Model R1025)
- Oscilloscope (Two-Channel)
- *Metrocom II* Self Test Unit (Motorola Model R1019)
- Assorted Clip Leads
- Regulated Power Supply (Motorola Model R1011A)
- General Tool Kit (Motorola Model TRN8794A)

3. PREVENTIVE MAINTENANCE

3.1 VISUAL INSPECTION

Check that external surfaces of the equipment are clean. Check that external connecting cables and wires are not damaged and that connections are firm.

3.2 CLEANING

Do not use solvents for cleaning the surfaces of the equipment. Solvents damage or mar the finish. Use a soft non-abrasive cloth moistened in a mild soap and water solution for cleaning the housings. Rinse the surfaces with a second cloth moistened in clean water.

CAUTION

DO NOT submerge any equipment in solvent or water solutions to clean them as this may cause damage to the equipment.

4. OPERATIONAL CHECKS

4.1 GENERAL

4.1.1 A system level operational check should be performed to determine the nature of the problem, and again, to ensure proper operation after the problem is corrected and the mobile is placed into service.

NOTE

If the data terminal is to be tested as part of a system, it is necessary to either connect an emergency alarm switch to the emergency alarm cable or ground the emergency alarm input. This is necessary since the emergency alarm is a normally closed loop, and an open input causes the logic to revert to the alarm mode. This does not apply when the unit is tested with the self-test unit because the emergency alarm is processed differently in the self-test mode.

4.1.2 Make sure that the mobile is within normal communication range of the dispatch center. Perform a system level operational check following the operating procedures in the Operation section of this manual. Pay close attention to how the controls and indicators (visual and audible) are functioning.

4.2 ALARM OPERATION

4.2.1 In addition to the normal operating functions, the emergency and mechanical alarm functions can also be checked. It is necessary for the dispatcher to verify, using voice communications, receipt of the alarm message.

4.2.2 To activate an emergency alarm, depress the emergency alarm switch or remove the ground (logic low) from the emergency alarm input.

4.2.3 To activate a mechanical alarm, place a ground (logic low) on a specific mechanical alarm input. (All mechanical alarms are enabled when Mechanical Alarm Disable input is low. When Mechanical Alarm Disable input is high, all mechanical alarms except #2 are disabled.) Each mechanical alarm input must be low for a certain predetermined period of time before the data terminal recognizes it as a valid alarm. The following is a list of mechanical alarm inputs and approximate time requirements.

- Mechanical Alarm 1 — 20 seconds provided the initial alarm condition ceased.
- Mechanical Alarm 2 — 5 seconds
- Mechanical Alarm 3 through 6 - 20 seconds

5. ANALYSIS

5.1 After performing a system level operational check, the technician should have gathered enough symptomatic information to allow him to isolate the problem to either the mobile data terminal or the radio set and in certain cases to circuit stages within the aforementioned.

5.2 Sometimes it may be necessary to perform equipment level testing to determine if the problem is in the radio or the logic unit. This type of testing is also necessary when troubleshooting the circuits of each piece of equipment. When testing or troubleshooting of the radio is required, refer to the radio set instruction manual for details. When testing or troubleshooting of the logic unit is required, refer to the Test Procedure paragraph.

5.3 The following is an example of a method used to isolate an operational problem. The analysis begins at the system level and progresses to the equipment level.

EXAMPLE: If while performing a voice communications request; the ACK indicator is off, the CALL indicator is on, and 5 seconds of beeping is heard, the terminal is operating in the fallback mode. Pick up handset and depress PTT switch to initiate communications with dispatcher. Determine if FID and VID are received by the dispatch center. If FID and VID are not received, check cabling between terminal and radio set. Next, check operation of radio set on the data channel. If radio set is operational, remove logic unit as described in the Installation section of this manual. Using the self-test unit, test the logic unit as described in the Test Procedure paragraph.

6. TEST PROCEDURES

6.1 GENERAL

6.1.1 The *Metrocom II* Self Test Unit provides a unique method of testing most of the logic functions and electronic circuitry of the MCT-1200 and the *Metrocom II* Mobile Communications Terminal. The logic unit contains a microprocessor with software instructions which determine how each type of unit functions. Within the software instructions is a self-test program which, when used with the self-test unit, checks all the input and output lines, and associated interfacing hardware. The technician simulates input conditions to the unit being tested through switches on the front panel of the test unit. The unit being tested detects the changed condition and outputs a resultant status signal which is displayed by LED indicators on the front panel of the test unit. (Refer to R1019 *Metrocom II* Self Test Unit instruction manual 68P81069A87 for switch and indicator description.) To control these tests, the test unit utilizes four modes of operation: Normal, fully automatic, manual, and semi-manual. The following paragraphs describe these modes of operation.

6.1.2 For all modes, connect the self test unit and power supply to the logic unit as shown in Figure 1.

6.2 NORMAL TEST MODE

In the normal mode, the test unit checks the overall function of the logic unit. The logic unit responds to front panel input from the test unit, just as the logic unit would in normal use. Furthermore, the test unit indicates the status of various logic unit outputs.

6.3 FULLY AUTOMATIC TEST MODE

In the fully automatic mode, the test unit automatically sequences through a series of 61 functional tests at a rate of about one test per second. The exact test being performed at any given time is indicated by two seven-segment LED readouts on the front panel of the test unit. Hence, the fully automatic mode verifies the functional integrity of the data unit by indicating any irregularities.

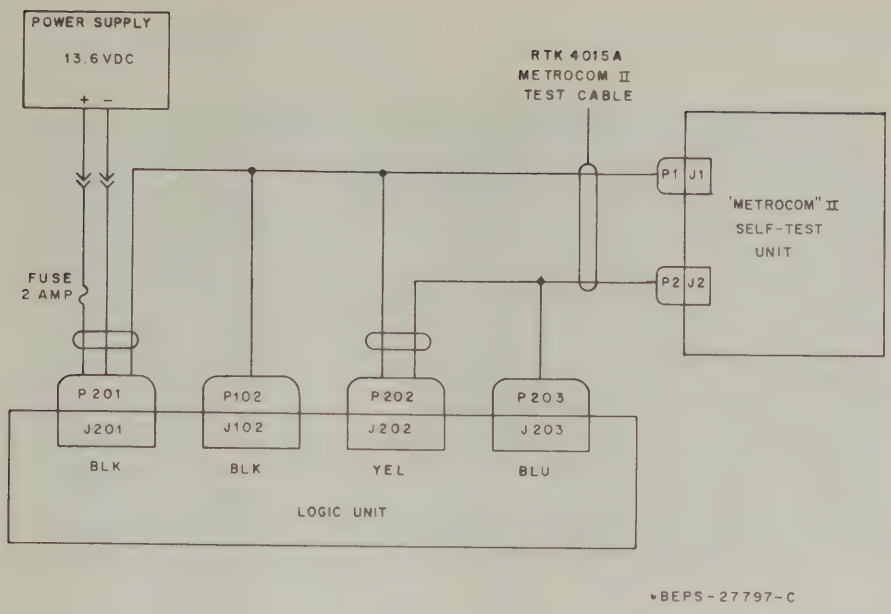


Figure 1. Metrocom II Self Test Unit Set-Up

Step 1. Set the self test unit SELF TEST switch to the ON position. (Test unit cannot go into fallback mode.)

Step 2. Connect jumpers JUF1 through JUF8 in logic unit to remote frequency selection (terminals A and B connected). Refer to Figure 2 for jumper locations.

Step 3. Use Troubleshooting Chart as a test guide. (Note that technician does not have to depress single step switch in this mode.)

Step 4. After test is finished, restore jumpers to original positions and disconnect self test unit and power supply.

6.4 SEMI-MANUAL TEST MODE

In the semi-manual mode, the test unit automatically sequences through a series of 61 functional tests until it encounters a fault condition. The fault stops the test sequence, and the test unit must be manually restarted, by depressing the STEP ADV switch, to continue the functional tests. Use the same procedure as described for the fully automatic test mode paragraph .

6.5 MANUAL TEST MODE

In the manual mode, the service technician can manually advance the sequence through a series of 61 functional tests. These tests are the same as those in the fully automatic mode, but now the technician can stop at a specific test that requires him to circuit trace, analyze, or make level adjustments.

Step 1. Connect jumpers JUF1 through JUF8 in logic unit to remote frequency selection (terminals A and B connected). Refer to Figure 2.

Step 2. Move jumpers JU102 and JU103 to connect terminals A and C as shown in Figure 3.

Step 3. Follow troubleshooting chart test procedure.

Step 4. After test is finished, restore jumpers to original positions. Disconnect self-test unit and power supply.

6.6 MISCELLANEOUS TESTS

6.6.1 Although the self-test unit and troubleshooting chart procedures verify operation of virtually all circuitry, some portions of the logic unit are not tested. The following is a list of untested circuits and a method for testing.

- LCD Heater — spray circuit cooler or equivalent into the LCD area. The current drain of the data unit should increase by approximately 1 ampere.
- Backlighting — observe that the bulbs (DS101 and DS109) are lit.
- Backplane Oscillator — verify that the backplane oscillator (U207D-8) frequency is between 60 and 500 Hz.

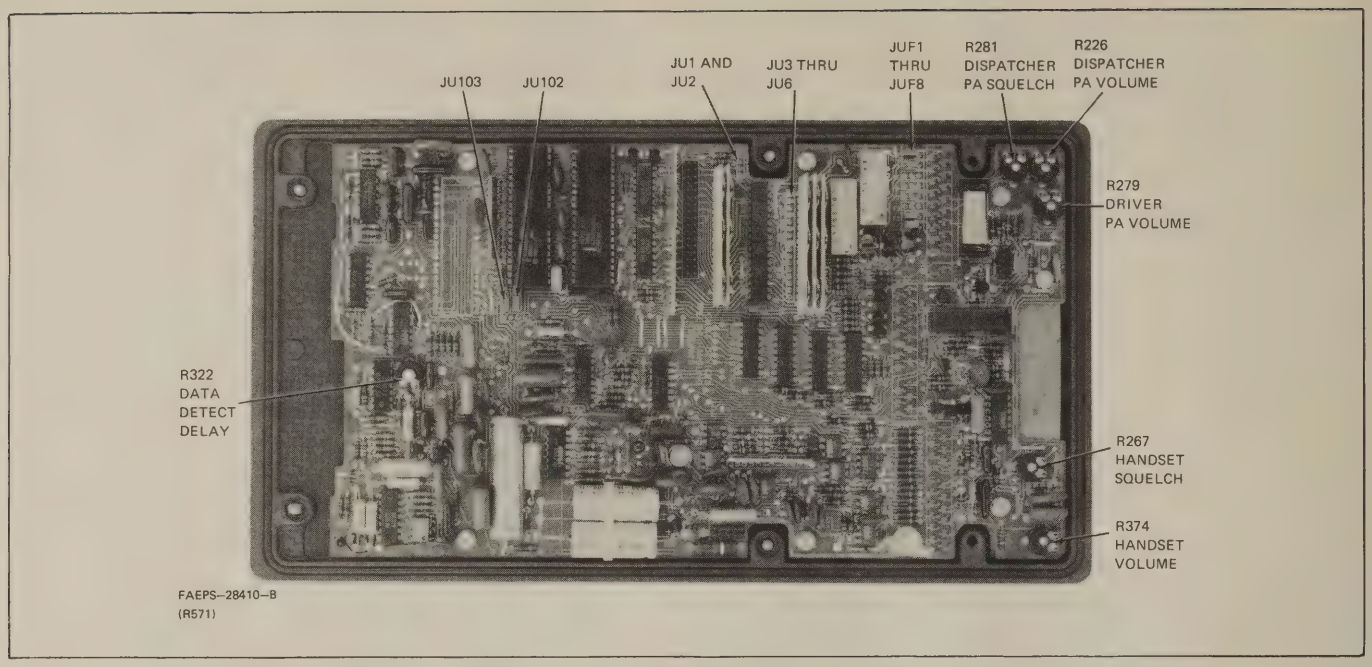


Figure 2.
Logic Unit Jumper And Adjustment Location Detail

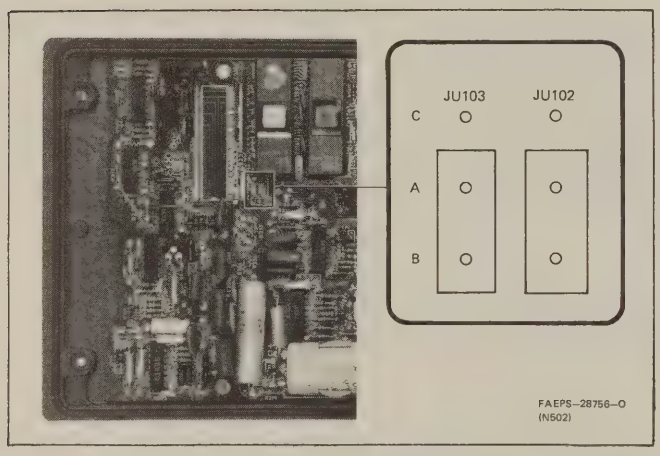


Figure 3. Self Test Jumper Detail

CAUTION

If the oscillator is not functioning and the LCD needs replacement, do not replace the LCD unless the backplane oscillator is repaired. If this is not done, the new LCD will be destroyed in a short time.

- Modem — Although the self-test unit tests the modem circuitry for 'severe' failures, such parameters as degradation in filter response, timing, etc. may not be detected. The best method of analysis is comparison to a known good unit using an oscilloscope.

- Audio/Squelch — These circuits can be tested by performing the volume and squelch adjustments described in the Adjustment Procedure paragraph.

6.6.2 When the technician is familiar with troubleshooting chart procedures, the abbreviated test procedure (shown in Table 1) can be used. If the indication of a particular test is incorrect, refer to the corresponding test number on the troubleshooting chart for further details.

Table 1. Abbreviated Self-Test Procedures

Test Number	In/Out	Test Performed & Indication
01	Output	PTT relay; PTT relay on.
02	Output	Data/Voice relay; no visible indication.
03	Output	Time-out timer; tone on (handset volume controlled).
04	Output	Individual call; intermittent tone.
05	Output	Group Call; continuous tone.
06	In/Out	Emergency alarm test; emergency alarm switch should be in off position, test number flashes if E.A. input is bad, otherwise test number is displayed.
07	Output	Monitor 1 LED on.
08	Output	Monitor 2 LED on.
09	Output	Monitor 3 LED on.
10	Output	Earpiece adjust; driver PA and earpiece enabled, earpiece speaker on, audio tone is heard.
11	Output	PA LED on.
12	Output	F3 LED on.
13	Output	F4 LED on.
14	Output	F5 LED on.
15	Output	F6 LED on.
16	Output	F7 LED on.
17	Output	F8 LED on.

Table 1. Abbreviated Self-Test Procedures (Cont'd.)

Test Number	In/Out	Test Performed & Indication
18	Output	PWR LED on, (front panel display).
19	Output	TX LED on, (front panel display).
20	Output	PA LED on, (front panel display). (option)
21	Output	ACK LED on, (front panel display).
22	Output	CALL LED on, (front panel display).
23	Output	Spare, no indication.
24	Output	LCD displays 11 (MSB).
25	Output	LCD displays 22.
26	Output	LCD displays 44.
27	Output	LCD displays 88.
28	Output	LCD displays 11 (middle).
29	Output	LCD displays 22.
30	Output	LCD displays 44.
31	Output	LCD displays 88.
32	Output	LCD displays 11 (L.S.B.).
33	Output	LCD displays 22.
34	Output	LCD displays 44.
35	Output	LCD displays 88.
36	Input	Mechanical Alarm 1.
37	Input	Emergency Alarm (Silent Alarm).
38	Input	Spare
39	Input	Mechanical Alarm Disable.
40	Input	Spare
41	Input	Handset PTT.
42	Input	Modem; data detect test. If display flashes adjust data detect delay adj. potentiometer.
43	Input	Monitor Data.
44	Input	Mechanical Alarm 2.
45	Input	Mechanical Alarm 3.
46	Input	Mechanical Alarm 4.
47	Input	Mechanical Alarm 5.
48	Input	Mechanical Alarm 6.
49	Input	Spare; display flashes.
50	Input	Spare; display flashes.
51	Input	Auto. Loc. PTT
52	Input	Monitor Ready
53	Input	GND - No Switch.
54	Input	GND - No Switch.
55	Input	GND - No Switch.
56	Input	S1-S6, JU1 & JU2 enabled.
57	Input	S7-S14 enabled.
58	Input	S201-A1, A2, S202-B1, B2, JU3, JU4, JU5 and JU6 enabled.
59	Input	S201-A3 through A10 enabled.
60	Input	S202-B3 through B10 enabled.
61	—	Data detect delay adjustment, modem troubleshooting. Continuous 1-0 tone transmitted.
62	—	End of test; intermittent beep on for approximately 8 seconds to check activity checker.
63	—	Reset pulse duration.
00	—	Logic Unit reset.

7. ADJUSTMENT PROCEDURE

7.1 GENERAL

Data detect delay, volume, and squelch adjustments are preset at the factory. These may require readjustment if associated circuitry is repaired or if directed to do so by the procedure in the troubleshooting chart. A special tuning tool, which is part of the TRN8794A General Tool Kit, is required for these adjustments. See Figure 2 for adjustment locations.

NOTE

The mobile data terminal has no deviation adjustment. The transmit audio output level is fixed.

7.2 DATA DETECT DELAY ADJUSTMENT

Step 1. Set up logic unit and self test unit for manual mode operation as described in the Test Procedures section paragraph.

Step 2. Manually advance test sequence to step 61.

Step 3. Connect channel 1 of dual trace oscilloscope to Discriminator Audio J203-12.

Step 4. Set oscilloscope to synchronize on message envelope shown in WF NO. 1 of Mobile Data Terminal Schematic Diagram.

Step 5. Connect channel 2 of dual trace oscilloscope to DATA DETECT (U206A output).

Step 6. Adjust R322 (Data Detect Delay Adj.) so that DATA DETECT goes low 35 milliseconds after data occurs on discriminator input J203-12. The oscilloscope display is shown in WF No. 6 of Mobile Data Terminal Schematic Diagram.

Step 7. Disconnect self-test unit and power supply. Restore jumpers per the Manual Mode paragraph Step 4.

Step 8. Reapply a room temperature vulcanizing compound (RTV) to mechanically 'fix' R322 positioning.

7.3. VOLUME AND SQUELCH ADJUSTMENTS

7.3.1. General

There are two separate volume and squelch adjustments in the logic unit. One controls the handset audio and the other controls the dispatcher PA audio. The handset audio/squelch circuits are located on the logic unit MPU board. The dispatcher PA audio/squelch circuits are located in the radio set. The dispatcher PA volume and squelch controls merely replace the radio set control head volume and squelch controls.

7.3.2 Dispatcher PA Volume & Squelch

To set the dispatcher PA volume and squelch levels, have dispatcher transmit a 'PA On' function to the unit. This enables monitoring of the PA speaker during adjustment. To make the volume and squelch adjustments perform the following steps:

Step 1. Set R281 (dispatcher PA squelch adjust) fully clockwise. This unsquelches the radio set audio circuits.

Step 2. Monitor speaker audio and adjust R266 (dispatcher PA volume adjust) for the correct public address audio level (from the dispatcher).

Step 3. With no voice transmission received from the dispatcher, but still in the dispatcher PA mode, adjust R281 clockwise until the PA audio just squelches.

Step 4. Disable the PA by transmitting (from dispatcher) a 'PA Off' function to the terminal.

7.3.3 Handset Volume & Squelch

To set the handset volume and squelch levels, place the terminal in the fallback mode by disconnecting the antenna cable from the radio set. The radio provides discriminator noise which can be monitored via the handset earpiece. Perform the following steps.

Step 1. Set R267 (handset squelch adjust) fully counterclockwise. This unsquelches the handset audio.

Step 2. Monitor handset earpiece audio and adjust R374 (handset volume adjust) to obatin a noise level that can be easily heard.

Step 3. Set R267 fully clockwise (tight squelch) and check that noise is not heard in the earpiece.

Step 4. Connect the antenna cable to the radio.

Step 5. Initiate a request-to-talk by depressing the REQUEST or PRIORITY switch. When audio is received from the dispatcher, check that the level in the handset earpiece is normal. If the audio level is not normal readjust R374 for the proper level.

7.4 DRIVER PA VOLUME ADJUSTMENT (OPTIONAL)

To set the driver PA volume level perform the following steps.

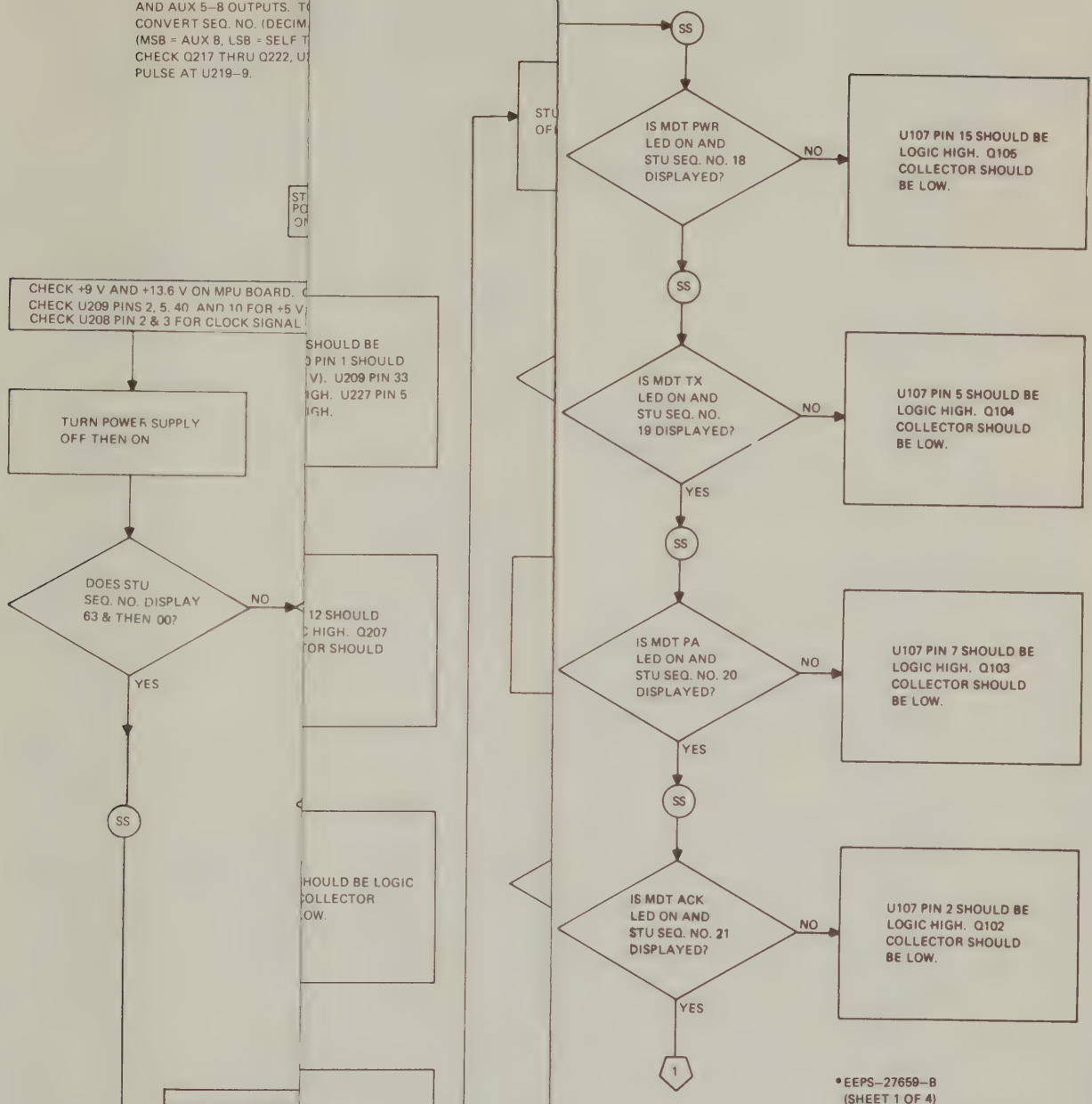
Step 1. Initiate the driver PA function by depressing PA switch. Observe that the PA indicator is on.

Step 2. Pick up handset. Depress the handset PTT switch and speak into handset mouthpiece.

Step 3. While speaking and monitoring speaker audio, adjust R279 (driver PA volume) to the desired speaker output level.

Step 4. Release handset PTT and return handset to hang up position.

Step 5. Turn off driver PA function by depressing PA switch. Observe that the PA indicator is off.


LEGEND:
STU - SELF TEST UNIT
MDT - MOBILE DATA TERMINA
SS = DEPRESS STU SINGLE STE
NOTES:
1. STU DERIVES SEQ. NO. FRO
AND AUX 5–8 OUTPUTS. T
CONVERT SEQ. NO. (DECIM
(MSB = AUX 8, LSB = SELF T
CHECK Q217 THRU Q222, U
PULSE AT U219–9.
CHECK +9 V AND +13.6 V ON MPU BOARD.
CHECK U209 PINS 2, 5, 40 AND 10 FOR +5 V
CHECK U208 PIN 2 & 3 FOR CLOCK SIGNAL
TURN POWER SUPPLY OFF THEN ON
DOES STU SEQ. NO. DISPLAY 63 & THEN 00?
NO
YES
SS
CHECK +5 V STANDB
11–19. TURN POWER
PIN 2) FOR MINIMUM
PULSE. CHECK Q105
SS
IS MDT PWR LED ON AND STU SEQ. NO. 18 DISPLAYED?
NO
U107 PIN 15 SHOULD BE LOGIC HIGH. Q105 COLLECTOR SHOULD BE LOW.
SS
IS MDT TX LED ON AND STU SEQ. NO. 19 DISPLAYED?
NO
U107 PIN 5 SHOULD BE LOGIC HIGH. Q104 COLLECTOR SHOULD BE LOW.
YES
SS
IS MDT PA LED ON AND STU SEQ. NO. 20 DISPLAYED?
NO
U107 PIN 7 SHOULD BE LOGIC HIGH. Q103 COLLECTOR SHOULD BE LOW.
YES
SS
IS MDT ACK LED ON AND STU SEQ. NO. 21 DISPLAYED?
NO
U107 PIN 2 SHOULD BE LOGIC HIGH. Q102 COLLECTOR SHOULD BE LOW.
YES
1
•EEPS–27659–B
(SHEET 1 OF 4)

Mobile Data Terminal Troubleshooting Chart Motorola No. PEPS-27798-B (Sheet 1 of 4)
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7.3.2 Dispatcher PA Volume & Squelch

To set the dispatcher PA volume and squelch levels, have dispatcher transmit a 'PA On' function to the unit. This enables monitoring of the PA speaker during adjustment. To make the volume and squelch adjustments perform the following steps:

Step 1. Set R281 (dispatcher PA squelch adjust) fully clockwise. This unsquelches the radio set audio circuits.

Step 2. Monitor speaker audio and adjust R266 (dispatcher PA volume adjust) for the correct public address audio level (from the dispatcher).

Step 3. With no voice transmission received from the dispatcher, but still in the dispatcher PA mode, adjust R281 clockwise until the PA audio just squelches.

Step 4. Disable the PA by transmitting (from dispatcher) a 'PA Off' function to the terminal.

7.3.3 Handset Volume & Squelch

To set the handset volume and squelch levels, place the terminal in the fallback mode by disconnecting the antenna cable from the radio set. The radio provides discriminator noise which can be monitored via the handset earpiece. Perform the following steps.

Step 1. Set R267 (handset squelch adjust) fully counterclockwise. This unsquelches the handset audio.

Step 2. Monitor handset earpiece audio and adjust R374 (handset volume adjust) to obatin a noise level that can be easily heard.

Step 3. Set R267 fully clockwise (tight squelch) and check that noise is not heard in the earpiece.

Step 4. Connect the antenna cable to the radio.

Step 5. Initiate a request-to-talk by depressing the REQUEST or PRIORITY switch. When audio is received from the dispatcher, check that the level in the handset earpiece is normal. If the audio level is not normal readjust R374 for the proper level.

7.4 DRIVER PA VOLUME ADJUSTMENT (OPTIONAL)

To set the driver PA volume level perform the following steps.

Step 1. Initiate the driver PA function by depressing PA switch. Observe that the PA indicator is on.

Step 2. Pick up handset. Depress the handset PTT switch and speak into handset mouthpiece.

Step 3. While speaking and monitoring speaker audio, adjust R279 (driver PA volume) to the desired speaker output level.

Step 4. Release handset PTT and return handset to hang up position.

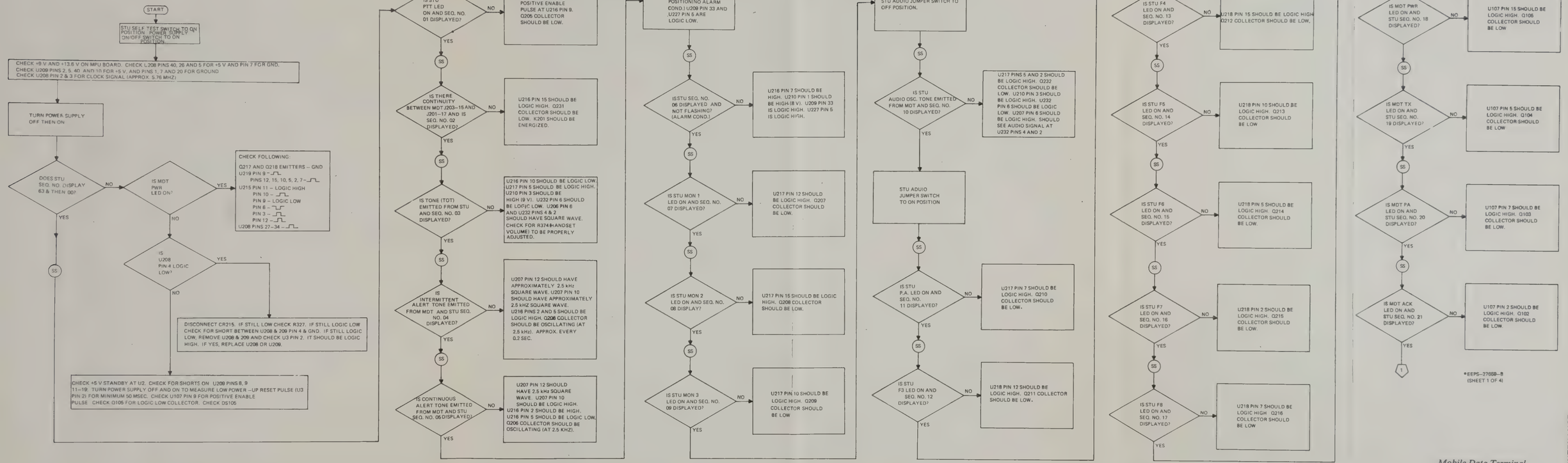
Step 5. Turn off driver PA function by depressing PA switch. Observe that the PA indicator is off.

LEGEND

STU - SELF TEST UNIT
MDT - MOBILE DATA TERMINAL
(SS) - DEPRESS STU SINGLE STEP SWITCH

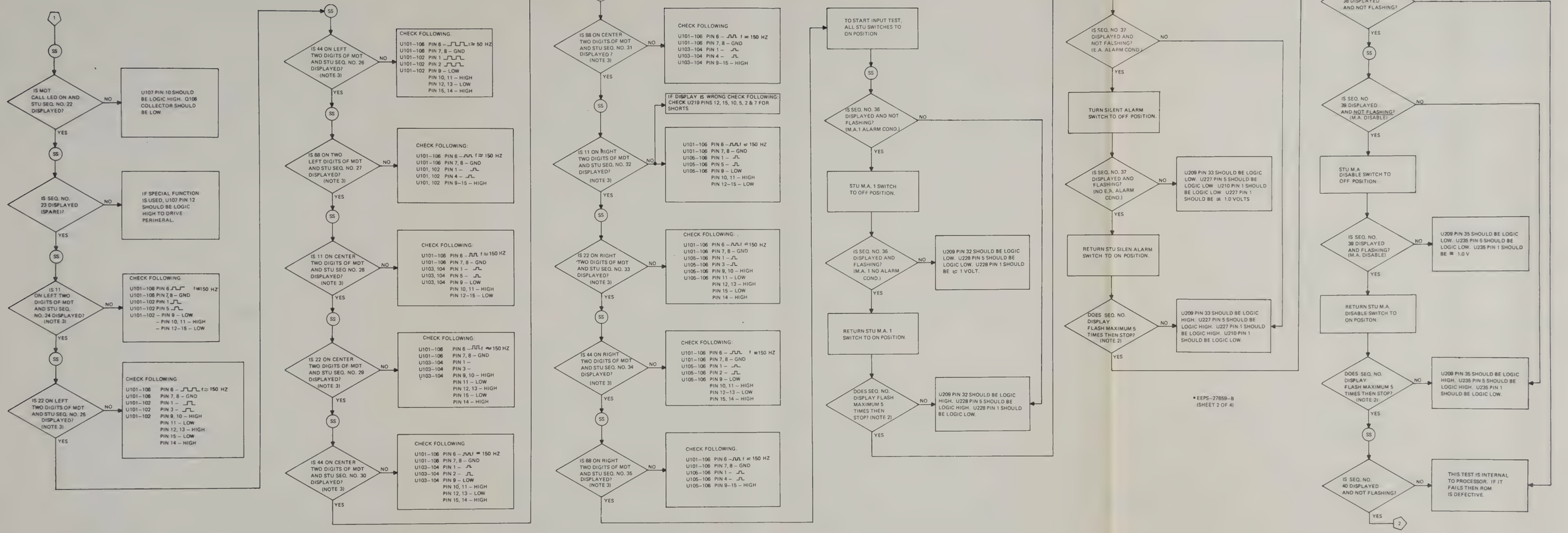
NOTES

1. STU DERIVES SEQ. NO. FROM MDT SELF TEST 1 & 2 AND AUX 5–8 OUTPUTS. TO DETERMINE OUTPUT STATES CONVERT SEQ. NO. (DECIMAL) TO BINARY AND THEN COMPLEMENT. (MSB = AUX 8, LSB = SELF TEST 1). IF SEQ. NO. DISPLAY IS INCORRECT, CHECK Q217 THRU Q222, U219 OUTPUTS, AND FOR POSITIVE PULSE AT U219–9
2. VERIFIES INPUT FUNCTION WENT FROM ONE STATE TO ANOTHER AND BACK WITHOUT LATCHING IN EITHER STATE.
3. FOR MDT MODEL T1940, DESREGARD CHECKS OF S1–S6, S9–S14, AND LCD DISPLAY.


START
STU SELF TEST SWITCH TO ON POSITION. POWER SUPPLY ON/OFF SWITCH TO ON POSITION
CHECK +9 V AND +13.8 V ON MPU BOARD. CHECK L208 PINS 40, 26 AND 5 FOR +5 V AND PIN 7 FOR GND.
CHECK U209 PINS 2, 5, 40 AND 10 FOR +5 V, AND PINS 1, 7 AND 20 FOR GROUND
CHECK U208 PIN 2 & 3 FOR CLOCK SIGNAL (APPROX. 5.76 MHz)
TURN POWER SUPPLY OFF THEN ON
DOES STU SEQ. NO. DISPLAY 63 & THEN 00?
NO
YES
IS MDT PWR LED ON?
YES
NO
CHECK FOLLOWING:
Q217 AND Q218 EMITTERS – GND
U219 PIN 9 –
PINS 12, 15, 10, 5, 2, 7 –
U215 PIN 11 – LOGIC HIGH
PIN 10 –
PIN 9 – LOGIC LOW
PIN 6 –
PIN 3 –
PIN 12 –
U208 PINS 27–34 –
(SS)
IS U208 PIN 4 LOGIC LOW?
YES
NO
DISCONNECT CR215. IF STILL LOW CHECK R327. IF STILL LOGIC LOW CHECK FOR SHORT BETWEEN U208 & 209 PIN 4 & GND. IF STILL LOGIC LOW, REMOVE U208 & 209 AND CHECK U3 PIN 2. IT SHOULD BE LOGIC HIGH. IF YES, REPLACE U208 OR U209.
CHECK +5 V STANDBY AT U2. CHECK FOR SHORTS ON U209 PINS 8, 9 11–19. TURN POWER SUPPLY OFF AND ON TO MEASURE LOW POWER –UP RESET PULSE (U3 PIN 2) FOR MINIMUM 50 MSEC. CHECK U107 PIN 9 FOR POSITIVE ENABLE PULSE. CHECK Q105 FOR LOGIC LOW COLLECTOR. CHECK Q5105
IS STU PTT LED ON AND SEQ. NO. 01 DISPLAYED?
NO
YES
U216 PIN 12 SHOULD BE HIGH. CHECK FOR POSITIVE ENABLE PULSE AT U216 PIN 9. Q205 COLLECTOR SHOULD BE LOW.
(SS)
IS THERE CONTINUITY BETWEEN MDT J203–15 AND J201–17 AND IS SEQ. NO. 02 DISPLAYED?
NO
YES
U216 PIN 15 SHOULD BE LOGIC HIGH. Q231 COLLECTOR SHOULD BE LOW. K201 SHOULD BE ENERGIZED.
(SS)
IS TONE (TOT) EMITTED FROM STU AND SEQ. NO. 03 DISPLAYED?
NO
YES
U216 PIN 10 SHOULD BE LOGIC LOW. U217 PIN 5 SHOULD BE LOGIC HIGH. U210 PIN 3 SHOULD BE HIGH (9 V). U232 PIN 6 SHOULD BE LOGIC LOW. U206 PIN 6 AND U232 PINS 4 & 2 SHOULD HAVE SQUARE WAVE. CHECK FOR R374 (HANDSET VOLUME) TO BE PROPERLY ADJUSTED.
(SS)
IS INTERMITTENT ALERT TONE EMITTED FROM MDT AND STU SEQ. NO. 04 DISPLAYED?
NO
YES
U207 PIN 12 SHOULD HAVE APPROXIMATELY 2.5 kHz SQUARE WAVE. U207 PIN 10 SHOULD HAVE APPROXIMATELY 2.5 kHZ SQUARE WAVE. U216 PINS 2 AND 5 SHOULD BE LOGIC HIGH. Q208 COLLECTOR SHOULD BE OSCILLATING (AT 2.5 kHz). APPROX. EVERY 0.2 SEC.
(SS)
IS CONTINUOUS ALERT TONE EMITTED FROM MDT AND STU SEQ. NO. 05 DISPLAYED?
NO
YES
U207 PIN 12 SHOULD HAVE 2.5 kHz SQUARE WAVE. U207 PIN 10 SHOULD BE LOGIC HIGH. U216 PIN 2 SHOULD BE HIGH. U216 PIN 5 SHOULD BE LOGIC LOW. Q206 COLLECTOR SHOULD BE OSCILLATING (AT 2.5 KHZ).
STU SILENT ALARM SWITCH TO OFF POSITION/NO ALARM COND.) U209 PIN 33 AND U227 PIN 5 ARE LOGIC LOW.
(SS)
IS STU SEQ. NO. 06 DISPLAYED AND NOT FLASHING? (ALARM COND.)
NO
YES
U216 PIN 7 SHOULD BE HIGH. U210 PIN 1 SHOULD BE HIGH (8 V). U209 PIN 33 IS LOGIC HIGH. U227 PIN 5 IS LOGIC HIGH.
(SS)
IS STU MON 1 LED ON AND SEQ. NO. 07 DISPLAYED?
NO
YES
U217 PIN 12 SHOULD BE LOGIC HIGH. Q207 COLLECTOR SHOULD BE LOW.
(SS)
IS STU MON 2 LED ON AND SEQ. NO. 08 DISPLAY?
NO
YES
U217 PIN 15 SHOULD BE LOGIC HIGH. Q208 COLLECTOR SHOULD BE LOW.
(SS)
IS STU MON 3 LED ON AND SEQ. NO. 09 DISPLAYED?
NO
YES
U217 PIN 10 SHOULD BE LOGIC HIGH. Q209 COLLECTOR SHOULD BE LOW
STU ADUIO JUMPER SWITCH TO OFF POSITION.
(SS)
IS STU AUDIO OSC. TONE EMITTED FROM MDT AND SEQ. NO. 10 DISPLAYED?
NO
YES
U217 PINS 5 AND 2 SHOULD BE LOGIC HIGH. Q232 COLLECTOR SHOULD BE LOW. U210 PIN 3 SHOULD BE LOGIC HIGH. U232 PIN 6 SHOULD BE LOGIC LOW. U207 PIN 6 SHOULD BE LOGIC HIGH. SHOULD SEE AUDIO SIGNAL AT U232 PINS 4 AND 2
STU ADUIO JUMPER SWITCH TO ON POSITION
(SS)
IS STU P.A. LED ON AND SEQ. NO. 11 DISPLAYED?
NO
YES
U217 PIN 7 SHOULD BE LOGIC HIGH. Q210 COLLECTOR SHOULD BE LOW.
(SS)
IS STU F3 LED ON AND SEQ. NO. 12 DISPLAYED?
NO
YES
U218 PIN 12 SHOULD BE LOGIC HIGH. Q211 COLLECTOR SHOULD BE LOW.
(SS)
IS STU F4 LED ON AND SEQ. NO. 13 DISPLAYED?
NO
YES
U218 PIN 15 SHOULD BE LOGIC HIGH Q212 COLLECTOR SHOULD BE LOW.
(SS)
IS STU F5 LED ON AND SEQ. NO. 14 DISPLAYED?
NO
YES
U218 PIN 10 SHOULD BE LOGIC HIGH. Q213 COLLECTOR SHOULD BE LOW
(SS)
IS STU F6 LED ON AND SEQ. NO. 15 DISPLAYED?
NO
YES
U218 PIN 5 SHOULD BE LOGIC HIGH. Q214 COLLECTOR SHOULD BE LOW.
(SS)
IS STU F7 LED ON AND SEQ. NO. 16 DISPLAYED?
NO
YES
U218 PIN 2 SHOULD BE LOGIC HIGH. Q215 COLLECTOR SHOULD BE LOW.
(SS)
IS STU F8 LED ON AND SEQ. NO. 17 DISPLAYED?
NO
YES
U218 PIN 7 SHOULD BE LOGIC HIGH. Q216 COLLECTOR SHOULD BE LOW
(SS)
IS MDT PWR LED ON AND STU SEQ. NO. 18 DISPLAYED?
NO
YES
U107 PIN 15 SHOULD BE LOGIC HIGH. Q105 COLLECTOR SHOULD BE LOW
(SS)
IS MDT TX LED ON AND STU SEQ. NO. 19 DISPLAYED?
NO
YES
U107 PIN 5 SHOULD BE LOGIC HIGH. Q104 COLLECTOR SHOULD BE LOW
(SS)
IS MDT PA LED ON AND STU SEQ. NO. 20 DISPLAYED?
NO
YES
U107 PIN 7 SHOULD BE LOGIC HIGH. Q103 COLLECTOR SHOULD BE LOW.
(SS)
IS MDT ACK LED ON AND STU SEQ. NO. 21 DISPLAYED?
NO
YES
U107 PIN 2 SHOULD BE LOGIC HIGH. Q102 COLLECTOR SHOULD BE LOW.
1

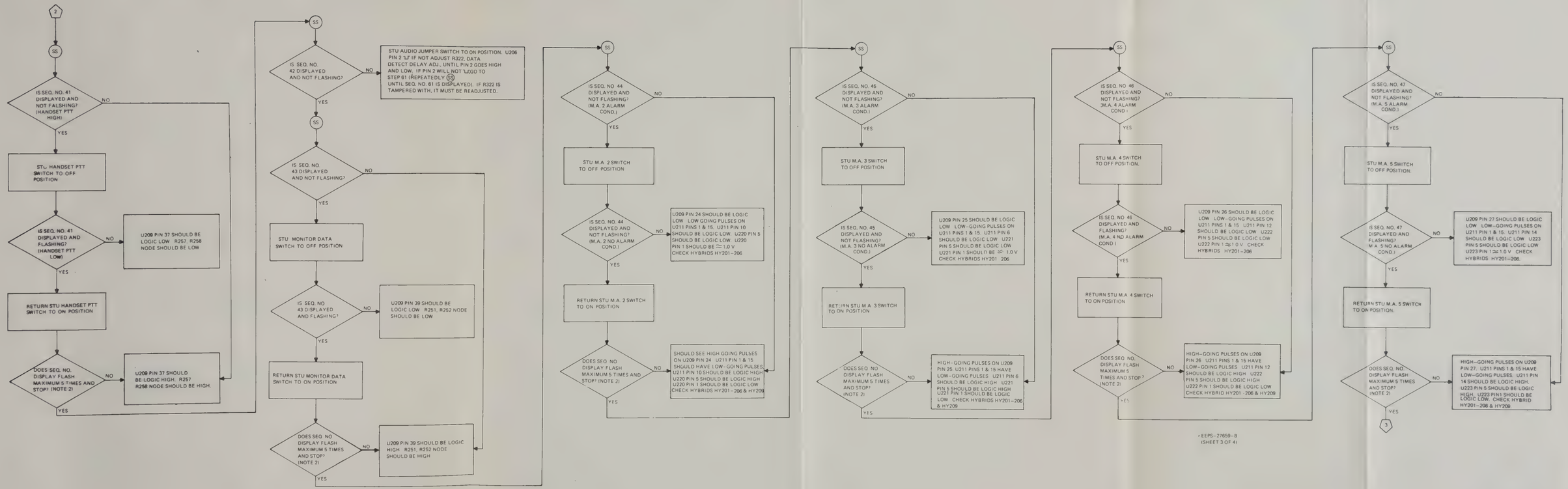
*EEPS–27659–B (SHEET 1 OF 4)

Mobile Data Terminal Troubleshooting Chart Motorola No. PEPS-27798-B (Sheet 1 of 4)
9/1/81-PH1


1
SS
IS MDT CALL LED ON AND STU SEQ. NO. 22 DISPLAYED?
NO
U107 PIN 10 SHOULD BE LOGIC HIGH. Q106 COLLECTOR SHOULD BE LOW.
YES
IS SEQ. NO. 23 DISPLAYED (SPARE)?
NO
IF SPECIAL FUNCTION IS USED, U107 PIN 12 SHOULD BE LOGIC HIGH TO DRIVE PERIHERAL.
YES
IS 11 ON LEFT TWO DIGITS OF MDT AND STU SEQ. NO. 24 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING
U101–106 PIN 6 – f≅150 HZ
U101–106 PIN 7,8 – GND
U101–102 PIN 1
U101–102 PIN 5
U101–102 – PIN 9 – LOW
– PIN 10, 11 – HIGH
– PIN 12–15 – LOW
YES
IS 22 ON LEFT TWO DIGITS OF MDT AND STU SEQ. NO. 25 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING
U101–106 PIN 6 – f≅ 150 HZ
U101–106 PIN 7, 8 – GND
U101–102 PIN 1 –
U101–102 PIN 3 –
U101–102 PIN 9, 10 – HIGH
PIN 11 – LOW
PIN 12, 13 – HIGH
PIN 15 – LOW
PIN 14 – HIGH
YES
IS 44 ON LEFT TWO DIGITS OF MDT AND STU SEQ. NO. 26 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING:
U101–106 PIN 6 – f≅ 50 HZ
U101–106 PIN 7, 8 – GND
U101–102 PIN 1
U101–102 PIN 2
U101–102 PIN 9 – LOW
PIN 10, 11 – HIGH
PIN 12, 13 – LOW
PIN 15, 14 – HIGH
YES
IS 88 ON TWO LEFT DIGITS OF MDT AND STU SEQ. NO. 27 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING:
U101–106 PIN 6 – f≅ 150 HZ
U101–106 PIN 7, 8 – GND
U101, 102 PIN 1 –
U101, 102 PIN 4 –
U101, 102 PIN 9–15 – HIGH
YES
IS 11 ON CENTER TWO DIGITS OF MDT AND STU SEQ. NO. 28 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING:
U101–106 PIN 6 – f≅150 HZ
U101–106 PIN 7, 8 – GND
U103, 104 PIN 1 –
U103, 104 PIN 5 –
U103, 104 PIN 9 – LOW
PIN 10, 11 – HIGH
PIN 12–15 – LOW
YES
IS 22 ON CENTER TWO DIGITS OF MDT AND STU SEQ. NO. 29 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING:
U101–108 PIN 6 – f≅ 150 HZ
U101–106 PIN 7, 8 – GND
U103–104 PIN 1 –
U103–104 PIN 3 –
U103–104 PIN 9, 10 – HIGH
PIN 11 – LOW
PIN 12, 13 – HIGH
PIN 15 – LOW
PIN 14 – HIGH
YES
IS 44 ON CENTER TWO DIGITS OF MDT AND STU SEQ. NO. 30 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING
U101–106 PIN 6 – f≅ 150 HZ
U101–108 PIN 7, 8 – GND
U103–104 PIN 1 –
U103–104 PIN 2 –
U103–104 PIN 9 – LOW
PIN 10, 11 – HIGH
PIN 12, 13 – LOW
PIN 15, 14 – HIGH
YES
IS 88 ON CENTER TWO DIGITS OF MDT AND STU SEQ. NO. 31 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING
U101–106 PIN 6 – f ≅ 150 HZ
U101–106 PIN 7, 8 – GND
U103–104 PIN 1 –
U103–104 PIN 4 –
U103–104 PIN 9–15 – HIGH
YES
IS 11 ON RIGHT TWO DIGITS OF MDT AND STU SEQ. NO. 32 DISPLAYED? (NOTE 3)
NO
IF DISPLAY IS WRONG CHECK FOLLOWING: CHECK U219 PINS 12, 15, 10, 5, 2 & 7 FOR SHORTS
U101–106 PIN 6 – f≅ 150 HZ
U101–106 PIN 7, 8 – GND
U105–106 PIN 1 –
U105–106 PIN 5 –
U105–106 PIN 9 – LOW
PIN 10, 11 – HIGH
PIN 12–15 – LOW
YES
IS 22 ON RIGHT TWO DIGITS OF MDT AND STU SEQ. NO. 33 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING:
U101–106 PIN 6 – f≅150 HZ
U101–106 PIN 7, 8 – GND
U105–106 PIN 1 –
U105–106 PIN 3 –
U105–106 PIN 9, 10 – HIGH
U105–106 PIN 11 – LOW
PIN 12, 13 – HIGH
PIN 15 – LOW
PIN 14 – HIGH
YES
IS 44 ON RIGHT TWO DIGITS OF MDT AND STU SEQ. NO. 34 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING:
U101–106 PIN 6 – f ≅150 HZ
U101–106 PIN 7, 8 – GND
U105–106 PIN 1 –
U105–106 PIN 2 –
U105–106 PIN 9 – LOW
PIN 10, 11 – HIGH
PIN 12–13 – LOW
PIN 15, 14 – HIGH
YES
IS 88 ON RIGHT TWO DIGITS OF MDT AND STU SEQ. NO. 35 DISPLAYED? (NOTE 3)
NO
CHECK FOLLOWING.
U101–106 PIN 6 – f ≅ 150 HZ
U101–106 PIN 7, 8 – GND
U106–106 PIN 1 –
U105–106 PIN 4 –
U105–106 PIN 9–15 – HIGH
YES
TO START INPUT TEST, ALL STU SWITCHES TO ON POSITION
IS SEQ. NO. 36 DISPLAYED AND NOT FLASHING? (M.A.1 ALARM COND.)
NO
YES
STU M.A. 1 SWITCH TO OFF POSITION.
IS SEQ. NO. 36 DISPLAYED AND FLASHING? (M.A. 1 NO ALARM COND.)
NO
U209 PIN 32 SHOULD BE LOGIC LOW. U228 PIN 5 SHOULD BE LOGIC LOW. U228 PIN 1 SHOULD BE ≅ 1 VOLT.
YES
RETURN STU M.A. 1 SWITCH TO ON POSITION.
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES THEN STOP? (NOTE 2)
NO
U209 PIN 32 SHOULD BE LOGIC HIGH. U228 PIN 5 SHOULD BE LOGIC HIGH. U228 PIN 1 SHOULD BE LOGIC LOW.
YES
IS SEQ. NO. 37 DISPLAYED AND NOT FALSHING? (E.A. ALARM COND.)
NO
YES
TURN SILENT ALARM SWITCH TO OFF POSITION.
IS SEQ. NO. 37 DISPLAYED AND FLASHING? (NO E.A. ALARM COND.)
NO
U209 PIN 33 SHOULD BE LOGIC LOW. U227 PIN 5 SHOULD BE LOGIC LOW. U210 PIN 1 SHOULD BE LOGIC LOW. U227 PIN 1 SHOULD BE ≅ 1.0 VOLTS
YES
RETURN STU SILEN ALARM SWITCH TO ON POSITION.
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES THEN STOP? (NOTE 2)
NO
U209 PIN 33 SHOULD BE LOGIC HIGH. U227 PIN 5 SHOULD BE LOGIC HIGH. U227 PIN 1 SHOULD BE LOGIC HIGH. U210 PIN 1 SHOULD BE LOGIC LOW.
YES
IS SEQ. NO. 38 DISPLAYED AND NOT FLASHING?
NO
YES
IS SEQ. NO. 39 DISPLAYED AND NOT FLASHING? (M.A. DISABLE)
NO
YES
STU M.A. DISABLE SWITCH TO OFF POSITION.
IS SEQ. NO. 39 DISPLAYED AND FLASHING? (M.A. DISABLE)
NO
U209 PIN 35 SHOULD BE LOGIC LOW. U235 PIN 5 SHOULD BE LOGIC LOW. U235 PIN 1 SHOULD BE ≅ 1.0 V
YES
RETURN STU M.A. DISABLE SWITCH TO ON POSITON.
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES THEN STOP? (NOTE 2)
NO
U209 PIN 35 SHOULD BE LOGIC HIGH. U235 PIN 5 SHOULD BE LOGIC HIGH. U235 PIN 1 SHOULD BE LOGIC LOW.
YES
IS SEQ. NO. 40 DISPLAYED AND NOT FLASHING?
NO
THIS TEST IS INTERNAL TO PROCESSOR. IF IT FAILS THEN ROM IS DEFECTIVE.
YES
2

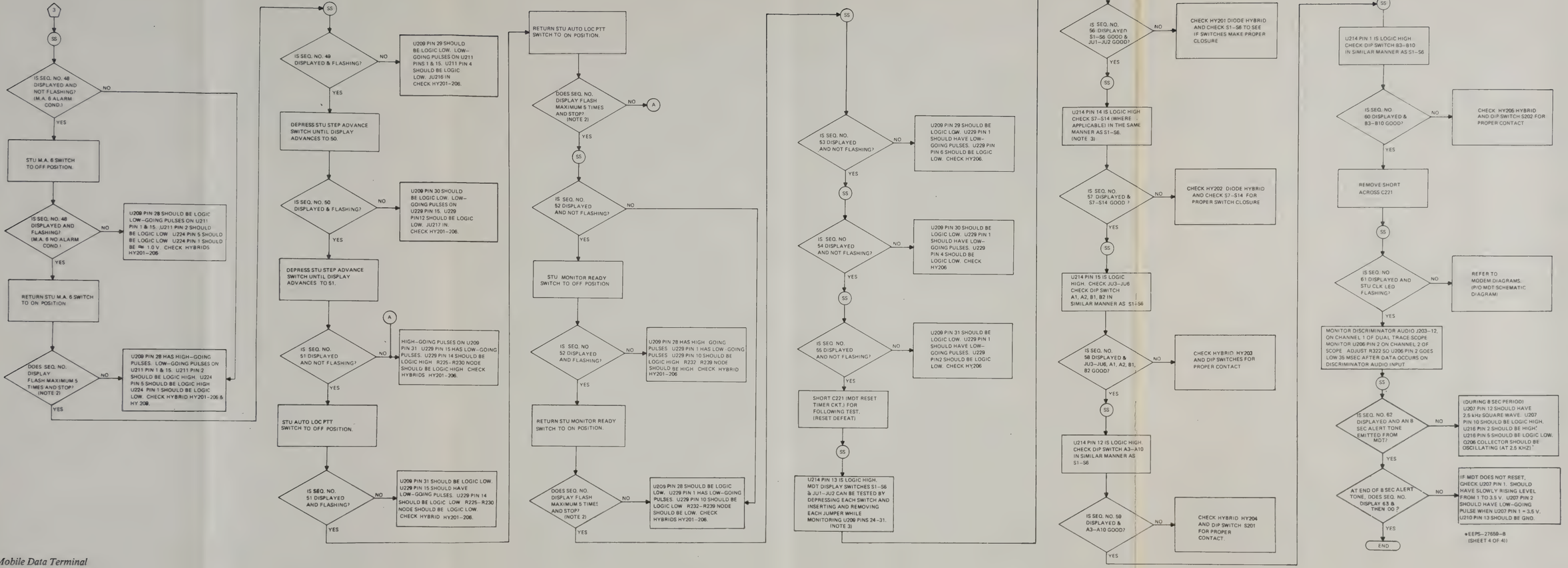
* EEPS–27859–B (SHEET 2 OF 4)

Mobile Data Terminal
Troubleshooting Chart
*Motorola No. **PEPS-27798-B***
(Sheet 2 of 4)
9/1/81- PHI

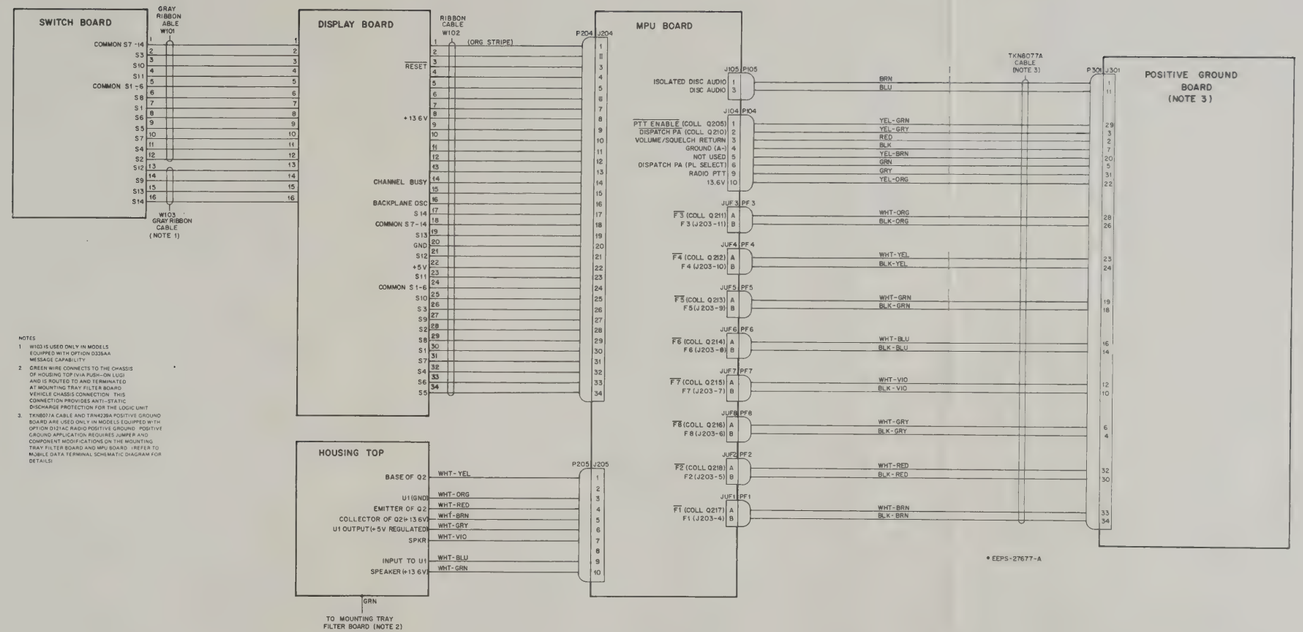

2
SS
IS SEQ. NO. 41 DISPLAYED AND NOT FALSHING? (HANDSET PTT HIGH)
NO
YES
STU HANDSET PTT SWITCH TO OFF POSITION
IS SEQ. NO. 41 DISPLAYED AND FLASHING? (HANDSET PTT LOW)
NO
U209 PIN 37 SHOULD BE LOGIC LOW R257, R258 NODE SHOULD BE LOW
YES
RETURN STU HANDSET PTT SWITCH TO ON POSITION
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
U209 PIN 37 SHOULD BE LOGIC HIGH. R257 R258 NODE SHOULD BE HIGH.
YES
SS
IS SEQ. NO. 42 DISPLAYED AND NOT FLASHING?
NO
STU AUDIO JUMPER SWITCH TO ON POSITION. U206 PIN 2 "L" IF NOT ADJUST R322, DATA DETECT DELAY ADJ., UNTIL PIN 2 GOES HIGH AND LOW. IF PIN 2 WILL NOT "LOGO TO STEP 81 (REPEATEDLY SS) UNTIL SEQ. NO. 61 IS DISPLAYED). IF R322 IS TAMPERED WITH, IT MUST BE READJUSTED.
YES
SS
IS SEQ. NO. 43 DISPLAYED AND NOT FLASHING?
NO
YES
STU MONITOR DATA SWITCH TO OFF POSITION
IS SEQ. NO. 43 DISPLAYED AND FLASHING?
NO
U209 PIN 39 SHOULD BE LOGIC LOW R251, R252 NODE SHOULD BE LOW
YES
RETURN STU MONITOR DATA SWITCH TO ON POSITION
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
U209 PIN 39 SHOULD BE LOGIC HIGH R251, R252 NODE SHOULD BE HIGH
YES
SS
IS SEQ. NO. 44 DISPLAYED AND NOT FLASHING? (M.A. 2 ALARM COND.)
NO
YES
STU M.A. 2 SWITCH TO OFF POSITION
IS SEQ. NO. 44 DISPLAYED AND NOT FLASHING? (M.A. 2 NO ALARM COND.)
NO
U209 PIN 24 SHOULD BE LOGIC LOW LOW GOING PULSES ON U211 PINS 1 & 15. U211 PIN 10 SHOULD BE LOGIC LOW. U220 PIN 5 SHOULD BE LOGIC LOW. U220 PIN 1 SHOULD BE ≅ 1.0 V CHECK HYBRIDS HY201–206
YES
RETURN STU M.A. 2 SWITCH TO ON POSITION
DOES SEQ. NO DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
SHOULD SEE HIGH GOING PULSES ON U209 PIN 24 U211 PIN 1 & 15 SHOULD HAVE LOW-GOING PULSES U211 PIN 10 SHOULD BE LOGIC HIGH U220 PIN 5 SHOULD BE LOGIC HIGH U220 PIN 1 SHOULD BE LOGIC LOW CHECK HYBRIDS HY201–206 & HY209
YES
SS
IS SEQ. NO. 45 DISPLAYED AND NOT FLASHING? (M.A. 3 ALARM COND.)
NO
YES
STU M.A. 3 SWITCH TO OFF POSITION
IS SEQ. NO. 45 DISPLAYED AND NOT FLASHING? (M.A. 3 NO ALARM COND.)
NO
U209 PIN 25 SHOULD BE LOGIC LOW LOW-GOING PULSES ON U211 PINS 1 & 15. U211 PIN 6 SHOULD BE LOGIC LOW. U221 PIN 5 SHOULD BE LOGIC LOW. U221 PIN 1 SHOULD BE ≅ 1.0 V CHECK HYBRIDS HY201–206
YES
RETURN STU M.A. 3 SWITCH TO ON POSITION
DOES SEQ. NO DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
HIGH-GOING PULSES ON U209 PIN 25. U211 PINS 1 & 15 HAVE LOW-GOING PULSES. U211 PIN 6 SHOULD BE LOGIC HIGH. U221 PIN 5 SHOULD BE LOGIC HIGH U221 PIN 1 SHOULD BE LOGIC LOW. CHECK HYBRIDS HY201–206 & HY209
YES
SS
IS SEQ. NO. 46 DISPLAYED AND NOT FLASHING? (M.A. 4 ALARM COND.)
NO
YES
STU M.A. 4 SWITCH TO OFF POSITION.
IS SEQ. NO. 46 DISPLAYED AND FLASHING? (M.A. 4 NO ALARM COND.)
NO
U209 PIN 26 SHOULD BE LOGIC LOW LOW-GOING PULSES ON U211 PINS 1 & 15. U211 PIN 12 SHOULD BE LOGIC LOW. U222 PIN 5 SHOULD BE LOGIC LOW U222 PIN 1 ≅ 1.0 V. CHECK HYBRIDS HY201–206
YES
RETURN STU M.A. 4 SWITCH TO ON POSITION
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
HIGH-GOING PULSES ON U209 PIN 26. U211 PINS 1 & 15 HAVE LOW-GOING PULSES. U211 PIN 12 SHOULD BE LOGIC HIGH. U222 PIN 5 SHOULD BE LOGIC HIGH U222 PIN 1 SHOULD BE LOGIC LOW CHECK HYBRID HY201 -206 & HY209
YES
SS
IS SEQ. NO. 47 DISPLAYED AND NOT FLASHING? (M.A. 5 ALARM COND.)
NO
YES
STU M.A. 5 SWITCH TO OFF POSITION.
IS SEQ. NO. 47 DISPLAYED AND FLASHING? M.A. 5 NO ALARM COND.)
NO
U209 PIN 27 SHOULD BE LOGIC LOW LOW-GOING PULSES ON U211 PIN 1 & 15. U211 PIN 14 SHOULD BE LOGIC LOW U223 PIN 5 SHOULD BE LOGIC LOW U223 PIN 1 ≅ 1.0 V CHECK HYBRIDS HY201–208.
YES
RETURN STU M.A. 5 SWITCH TO ON POSITION.
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
HIGH-GOING PULSES ON U209 PIN 27. U211 PINS 1 & 15 HAVE LOW-GOING PULSES. U211 PIN 14 SHOULD BE LOGIC HIGH. U223 PIN 5 SHOULD BE LOGIC HIGH. U223 PIN1 SHOULD BE LOGIC LOW. CHECK HYBRID HY201–206 & HY209.
YES
3

*EEPS-27659-B
(SHEET 3 OF 4)

Mobile Data Terminal
Troubleshooting Chart
Motorola No. ***PEPS-27798-B***
(Sheet 3 of 4)
9/1/81- PHI


3
SS
IS SEQ. NO. 48 DISPLAYED AND NOT FLASHING? (M.A. 6 ALARM COND.)
NO
YES
STU M.A. 6 SWITCH TO OFF POSITION.
IS SEQ. NO. 48 DISPLAYED AND FLASHING? (M.A. 6 NO ALARM COND.)
NO
U209 PIN 28 SHOULD BE LOGIC LOW–GOING PULSES ON U211 PIN 1 & 15. U211 PIN 2 SHOULD BE LOGIC LOW. U224 PIN 5 SHOULD BE LOGIC LOW. U224 PIN 1 SHOULD BE ≈ 1.0 V. CHECK HYBRIDS HY201–206
YES
RETURN STU M.A. 6 SWITCH TO ON POSITION.
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
U209 PIN 28 HAS HIGH–GOING PULSES. LOW–GOING PULSES ON U211 PIN 1 & 15. U211 PIN 2 SHOULD BE LOGIC HIGH. U224 PIN 5 SHOULD BE LOGIC HIGH U224 PIN 1 SHOULD BE LOGIC LOW. CHECK HYBRID HY201–206 & HY 209.
YES
SS
IS SEQ. NO. 49 DISPLAYED & FLASHING?
NO
U209 PIN 29 SHOULD BE LOGIC LOW. LOW–GOING PULSES ON U211 PINS 1 & 15. U211 PIN 4 SHOULD BE LOGIC LOW. JU216 IN. CHECK HY201–206.
YES
DEPRESS STU STEP ADVANCE SWITCH UNTIL DISPLAY ADVANCES TO 50.
IS SEQ. NO. 50 DISPLAYED & FLASHING?
NO
U209 PIN 30 SHOULD BE LOGIC LOW. LOW–GOING PULSES ON U229 PIN 15. U229 PIN12 SHOULD BE LOGIC LOW. JU217 IN. CHECK HY201–206.
YES
DEPRESS STU STEP ADVANCE SWITCH UNTIL DISPLAY ADVANCES TO 51.
A
IS SEQ. NO. 51 DISPLAYED AND NOT FLASHING?
NO
HIGH–GOING PULSES ON U209 PIN 31. U229 PIN 15 HAS LOW–GOING PULSES. U229 PIN 14 SHOULD BE LOGIC HIGH. R225–R230 NODE SHOULD BE LOGIC HIGH. CHECK HYBRIDS. HY201–206.
YES
STU AUTO LOC PTT SWITCH TO OFF POSITION.
IS SEQ. NO. 51 DISPLAYED AND FLASHING?
NO
U209 PIN 31 SHOULD BE LOGIC LOW. U229 PIN 15 SHOULD HAVE LOW–GOING PULSES. U229 PIN 14 SHOULD BE LOGIC LOW. R225–R230 NODE SHOULD BE LOGIC LOW. CHECK HYBRID HY201–206.
YES
RETURN STU AUTO LOC PTT SWITCH TO ON POSITION.
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
A
YES
SS
IS SEQ. NO. 52 DISPLAYED AND NOT FLASHING?
NO
YES
STU MONITOR READY SWITCH TO OFF POSITION.
IS SEQ. NO 52 DISPLAYED AND FLASHING?
NO
U209 PIN 28 HAS HIGH GOING PULSES U229 PIN 1 HAS LOW–GOING PULSES U229 PIN 10 SHOULD BE LOGIC HIGH R232 R239 NODE SHOULD BE HIGH CHECK HYBRID HY201–206
YES
RETURN STU MONITOR READY SWITCH TO ON POSITION.
DOES SEQ. NO. DISPLAY FLASH MAXIMUM 5 TIMES AND STOP? (NOTE 2)
NO
U209 PIN 28 SHOULD BE LOGIC LOW. U229 PIN 1 HAS LOW–GOING PULSES. U229 PIN 10 SHOULD BE LOGIC LOW R232–R239 NODE SHOULD BE LOW. CHECK HYBRIDS HY201–206.
YES
SS
IS SEQ. NO. 53 DISPLAYED AND NOT FLASHING?
NO
U209 PIN 29 SHOULD BE LOGIC LOW. U229 PIN 1 SHOULD HAVE LOW–GOING PULSES. U229 PIN PIN 6 SHOULD BE LOGIC LOW. CHECK HY206.
YES
SS
IS SEQ. NO 54 DISPLAYED AND NOT FLASHING?
NO
U209 PIN 30 SHOULD BE LOGIC LOW. U229 PIN 1 SHOULD HAVE LOW–GOING PULSES. U229 PIN 4 SHOULD BE LOGIC LOW. CHECK HY206
YES
SS
IS SEQ. NO. 55 DISPLAYED AND NOT FLASHING?
NO
U209 PIN 31 SHOULD BE LOGIC LOW. U229 PIN 1 SHOULD HAVE LOW–GOING PULSES. U229 PIN2 SHOULD BE LOGIC LOW. CHECK HY206
YES
SHORT C221 (MDT RESET TIMER CKT.) FOR FOLLOWING TEST. (RESET DEFEAT)
SS
U214 PIN 13 IS LOGIC HIGH. MDT DISPLAY SWITCHES S1–S6 & JU1–JU2 CAN BE TESTED BY DEPRESSING EACH SWITCH AND INSERTING AND REMOVING EACH JUMPER WHILE MONITORING U209 PINS 24–31. (NOTE 3)
IS SEQ. NO. 56 DISPLAYED S1–S6 GOOD & JU1–JU2 GOOD?
NO
CHECK HY201 DIODE HYBRID AND CHECK S1–S6 TO SEE IF SWITCHES MAKE PROPER CLOSURE
YES
SS
U214 PIN 14 IS LOGIC HIGH CHECK S7–S14 (WHERE APPLICABLE) IN THE SAME MANNER AS S1–S6. (NOTE 3)
IS SEQ. NO. 57 DISPLAYED & S7–S14 GOOD ?
NO
CHECK HY202 DIODE HYBRID AND CHECK S7–S14 FOR PROPER SWITCH CLOSURE
YES
SS
U214 PIN 15 IS LOGIC HIGH. CHECK JU3–JU6 CHECK DIP SWITCH A1, A2, B1, B2 IN SIMILAR MANNER AS S1–S6
IS SEQ. NO. 58 DISPLAYED & JU3–JU6, A1, A2, B1, B2 GOOD?
NO
CHECK HYBRID HY203 AND DIP SWITCHES FOR PROPER CONTACT
YES
SS
U214 PIN 12 IS LOGIC HIGH CHECK DIP SWITCH A3–A10 IN SIMILAR MANNER AS S1–S6
IS SEQ. NO. 59 DISPLAYED & A3–A10 GOOD?
NO
CHECK HYBRID HY204 AND DIP SWITCH S201 FOR PROPER CONTACT.
YES
SS
U214 PIN 1 IS LOGIC HIGH CHECK DIP SWITCH B3–B10 IN SIMILAR MANNER AS S1–S6
IS SEQ. NO 60 DISPLAYED & B3–B10 GOOD?
NO
CHECK HY206 HYBRID AND DIP SWITCH S202 FOR PROPER CONTACT
YES
REMOVE SHORT ACROSS C221
SS
IS SEQ. NO 61 DISPLAYED AND STU CLK LED FLASHING?
NO
REFER TO MODEM DIAGRAMS. (PIO MDT SCHEMATIC DIAGRAM)
YES
MONITOR DISCRIMINATOR AUDIO J203–12, ON CHANNEL 1 OF DUAL TRACE SCOPE MONITOR U206 PIN 2 ON CHANNEL 2 OF SCOPE. ADJUST R322 SO U206 PIN 2 GOES LOW 35 MSEC AFTER DATA OCCURS ON DISCRIMINATOR AUDIO INPUT
SS
IS SEQ. NO. 62 DISPLAYED AND AN 8 SEC ALERT TONE EMITTED FROM MDT?
NO
(DURING 8 SEC PERIOD) U207 PIN 12 SHOULD HAVE 2.5 kHz SQUARE WAVE. U207 PIN 10 SHOULD BE LOGIC HIGH. U216 PIN 2 SHOULD BE HIGH. U216 PIN 5 SHOULD BE LOGIC LOW. Q206 COLLECTOR SHOULD BE OSCILLATING (AT 2.5 KHZ).
YES
AT END OF 8 SEC ALERT TONE, DOES SEQ. NO. DISPLAY 63 & THEN 00 ?
NO
IF MDT DOES NOT RESET, CHECK U207 PIN 1. SHOULD HAVE SLOWLY RISING LEVEL FROM 1 TO 3.5 V. U207 PIN 2 SHOULD HAVE LOW–GOING PULSE WHEN U207 PIN 1 = 3.5 V. U210 PIN 13 SHOULD BE GND.
YES
END
◆EEPS–27659–B (SHEET 4 OF 4)

Mobile Data Terminal
Troubleshooting Chart
Motorola No. PEPS-27798-B
(Sheet 4 of 4)
9/1/81- PHI



NOTES

1. W103 IS USED ONLY IN MODELS EQUIPPED WITH OPTION D326AA MESSAGE CAPABILITY.
2. GREEN WIRE CONNECTS TO THE CHASSIS OF HOUSING TOP (VIA PUSH-ON LUG) AND IS ROUTED TO AND TERMINATED AT MOUNTING TRAY FILTER BOARD VEHICLE CHASSIS CONNECTION. THIS CONNECTION PROVIDES ANTI-STATIC DISCHARGE PROTECTION FOR THE LOGIC UNIT.
3. TKN8013A CABLE AND TRN4128A POSITIVE GROUND BOARD ARE USED ONLY IN MODELS EQUIPPED WITH OPTION D121AC RADIO POSITIVE GROUND. POSITIVE GROUND APPLICATION REQUIRES JUMPER AND COMPONENT MODIFICATIONS ON THE MOUNTING TRAY FILTER BOARD AND MPU BOARD - REFER TO MOBILE DATA TERMINAL SCHEMATIC DIAGRAM FOR DETAILS!

Mobile Data Terminal
Interconnect Cabling Diagrams,
Filter Board Schematic Diagram
and Circuit Board Detail,
and Parts Lists
Motorola No. ***PEPS-32713-A***
(Sheet 1 of 3)
2/1/83- PHI

parts list

TRN8793A Installation Hardware Kit — PL-6373-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-844417	NUT; strip; 6 used
	3-13948	SCREW, machine: 10-32 x 5/8"; 6 used
	4-7565	WASHER, flat: 0.219 x 0.500 x .048; 6 used
	5-10115A43	GROMMET, rubber
	54-84697B01	LABEL

TRN8720A Housing Hardware Kit — PL-6369-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-129892	NUT; 8-32 x 5/16 x 1/8" hex: 4 used
	3-124074	SCREW, machine: 8-32 x 1/2"; 4 used
	3-135506	SCREW, tapping: 6-32 x 1/4"; 6 used
	3-138891	SCREW, tapping: 6-32 x 7/16"; 4 used
	3-82739M01	SCREW, machine: 10-32 x 2-1/4"; 2 used
	3-83466M01	SCREW, captive; 4 used
	15-82288M01	HOUSING, bottom
	15-82289M01	HOUSING, rear
	32-84571L02	GASKET, .125 O.D. x .085 I.D.; 53"
	33-82745M01	NAMEPLATE
	42-10128A15	RETAINER, ring; 2 used
	42-82893M01	CLIP, circuit board; 4 used
	43-82666M01	BUSHING, lock
	43-83414M01	SPACER; 4 used
	9-84181L01	SOCKET, 2 contact

TRN8804A Alarm Switch, Panel Mounting — PL-6627-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		switch:
	40-82608M02	spst, pushbutton
		mechanical part
	564-84697B07	LABEL

TRN4247A and TRN4279A Jumpers — PL-7459-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	9-84181L01	SOCKET, 2 contact; (TRN4247A 5 used) (TRN4279A 1 used)

TKN8126A Power Cable (20') — PL-7054-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F1	65-86099	7.5 amp; 32 V
		connector, plug: consists of:
P1	15-10183A74	HOUSING, connector: 2 position
	39-10184A91	CONTACT, receptacle; 2 used
		non-referenced items
	14-82882A01	INSULATOR, fuse holder body
	14-82883A01	INSULATOR, fuse holder cap
	41-82885A01	SPRING, fuse compressor
	42-82884A01	CLIP, fuse
	30-82775M01	CABLE, 2 conductor; 20' used

TKN8127A/TKN8128A Radio Cable (20') — PL-7062-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug: consists of:
P3	15-83498F37	HOUSING, connector: 6 position
	29-83452L01	TERMINAL, female; 4 used
	43-84798P01	POLARIZING KEY; 1 used
P203	14-84556B02	HOUSING, connector: 22 position
	9-84151B03	RECEPTACLE, contact; 19 used
P204	9-84086B01	RECEPTACLE, female; 37 contact
	9-84151B03	RECEPTACLE, contact; 23 used
	15-84044C03	HOUSING, receptacle (front)
	15-84045C01	HOUSING, receptacle (rear)
		non-referenced items
	3-132127	SCREW, tapping: 6-20 x 3/4"
	3-139999	SCREW, tapping: 6-19 x 3/8"; 2 used
	3-140000	SCREW, tapping: 6-19 x 3/4"
	30-813233	CABLE, battery: red; 22' used
	30-831572	CABLE, battery: blk; 22' used
	30-83272E01	CABLE, 20 conductor; 22' used
	42-84933E01	CLAMP, strain relief
	54-84698B01	LABEL, negative ground

TKN8129A Radio Cable (20')
TKN8243A Radio Cable (22') — PL-7483-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug: consists of:
P3	15-83498F37	HOUSING, connector: 6 position
	29-83452L01	TERMINAL, female; 5 used
	43-84798F01	POLARIZING KEY; 1 used
P203	14-84556B02	HOUSING, connector: 22 position
	9-84151B03	RECEPTACLE, contact; 15 used
P204	9-80169C01	RECEPTACLE, female; 19 contact
	15-82075D01	HOUSING, plug (right hand)
	15-82075D03	HOUSING, plug (left hand)
		non-referenced items
	3-132127	SCREW, tapping: 6-20 x 3/4"; 2 used
	2-129924	NUT, hex: 4-40 x 1/4" x 3/32"; 2 used
	3-131758	SCREW, machine: 4-40 x 1-1/8"; 2 used
	3-867088	SCREW, cover retaining
	4-11722	WASHER, "O"
	4-800671	WASHER
	4-82113D01	WASHER, felt
	36-867087	KNOB, retainer
	30-812505	CABLE, battery: red; 22' used
	30-851875	CABLE, battery: blk; 22' used
	30-83272E01	CABLE, 20 conductor; 22' used
	42-864148	STRAIN RELIEF

TKN8130A Alarm Cable Kit (15') — PL-7056-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug: consists of:
P2	15-83498F36	HOUSING, connector; 11 position
	29-83452L01	TERMINAL, contact: female; 9 used
	43-84798F01	INSERT, polarizing key
P201		consists of:
	14-84556B01	HOUSING, connector: blk
	9-84151B03	CONTACT, receptacle; 9 used
	9-84151B05	CONTACT, receptacle; 11 used
		non-referenced items
	30-82091M01	CABLE, 14 conductor; 15' used

TKN6458A Cable and Fuse Kit — PL-6474-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F1	65-84161B01	40 amp; 32 V
		mechanical parts
	3-400465	SCREW, tapping: 10-12 x 3/4"
	3-84277B02	FUSEHOLDER
	38-84383D01	CAP, protective
	42-84275B01	RETAINER, fuse
	54-84697B01	LABEL
	29-84528B05	LUG, ring tongue

TRN8775A Escutcheon — PL-6371-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	5-82781M01	RIVET, nylon; 2 used
	13-82387M02	ESCUTCHEON
	38-83037M01	RUBBER BUTTON; display; 8 used
	43-82766M01	SPACER
	61-82390M03	LENS, led; 4 used

TMN6143A Handset Armored Cable
TMN6144A Handset Coil Cord Cable — PL-6362-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		cartridge, microphone:
DP1	59-82933C02	Dynamic
DP2	59-84058A01	impedance; 150 ohm (receiver headset)
		resistor, fixed:
R1	6-124C23	82 ± 10%; 1/4 W
		switch:
S1	40-83985F01	spst
		mechanical parts
	3-124432	SCREW, machine: 4-40 x 1/4"; 2 used
	7-84427G01	BRACKET, cable
	15-84053A01	COVER, switch
	15-84107A16	HOUSING, handset with cap
	29-847033	LUG, insulator; 3 used
	32-82942B03	GASKET, "O" ring
	42-10217A02	STRAP, tie; 2 used
	3-2950	SCREW, machine: 4-40 x 1/4" (THN6144A)
	42-82782A01	CLAMP, ground (THN6144A)
	42-83980F01	RETAINER (THN6144A)
	3-2950	SCREW, machine: 4-40 x 1/4"
	30-864145	SCREW, 5-conductor; 59" used (TMN6143A)
	30-83847E02	SCREW, armor; protection 48" used (TMN6143A)
	30-82565B35	CABLE, coil cord (TMN6144A)

TRN4471A/TRN4472A Filter Board — PL-7048-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C1, 2	23-82077C25	500 uF + 75-10%; 80 V
		diode: (see note)
CR1	48-82525G02	silicon
CR2	48-84250L02	rectifier
		connector, receptacle:
J1	28-84645M01	male, 2-contact
J2	28-84646M02	male, 11-contact
J3	28-84648M01	male, 6-contact
J4	—	consists of:
	29-84547B03	PIN, contact; 2 used
	42-84067C01	RETAINER, connector
		coil:
L1, 2	25-84379L07	choke, 350 uH
		mechanical parts
	2-131435	NUT, hex: 4-40 x 1/4 x 3/32"; 2 used
	3-138813	SCREW, machine: 4-40 x 3/8"; 4 used
	4-9777	WASHER, split lock #4; 2 used
	31-82891M01	STRIP, terminal: 5-terminal; 3 used
	42-82919M01	CLIP, mounting; 2 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN4468A/TRN4470A Tray Hardware Kit — PL-7106-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-121841	NUT, hex: 6-32 x 5/16 x 7/64"; 4 used
	3-135506	SCREW, tapping: 6-32 x 1/4"; 6 used
	3-136993	SCREW, machine: 6-32 x 3/8"; 2 used
	3-84630M01	SCREW, captive; 4 used
	4-1719	WASHER, flat; 2 used
	4-7652	WASHER, lock: #10 ext.; 4 used
	4-129021	WASHER, lock: #3/4 Int.; 2 used
	4-131332	WASHER, flat: .266 x .500 x .036"; 2 used
	4-873839	WASHER, spring; 2 used
	5-10115A43	GROMMET, rubber
	7-83248L03	BRACKET, locking
	7-84629M01	TRAY, mounting (TRN4468A)
	41-84756L01	SPRING; 2 used
	42-861179	CLIP, cable: 5/16" ID
	42-10217A02	STRAP, tie
	42-82143C02	CLAMP, cable: 1/4" ID
	42-82143C08	CLAMP, cable: 3/8" ID
	42-82846M01	CLAMP, cable: .317-.327 ID
	7-84629M02	TRAY, mounting (TRN4470A only)
	3-84630M02	SCREW, captive; 4 used
	64-84804M01	PLATE, mounting
	42-82846M03	CLIP, cable (TRN4468A, TRN4470A)
	42-82143M03	CLIP, cable (TRN4469A)
	7-84629M03	TRAY (TRN4469A)
	9-82672G01	RECEPTACLE, 6-contact (TRN4469A)
	64-84804M01	PLATE, mounting

TRN8777A Clip Hang-up — PL-6367-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-139471	SCREW, cap: 6-32 x 1" hex; 2 used
	41-82712K01	SPRING; hang-up
	55-82903M01	HANDLE; handset
	55-82903M02	HANDLE; handset

TRN8792A Escutcheon — PL-6625-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	13-82387M03	ESCUTCHEON (TRN8792A)
	38-83037M01	RUBBER BUTTON display; 2 used
	43-82766M02	SPACER
	61-82390M03	LENS, led
	5-82781M01	RIVET, nylon; 2 used

QKN7259A Radio Cable (22') — PL-8325-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug: consists of:
P3	15-83498F37	HOUSING, connector; 6-position
	29-83452L01	TERMINAL, female; 4 used
	43-84798F01	POLARIZING KEY; 1 used
P203	14-84556B02	HOUSING, connector; 22-position
	9-84151B03	RECEPTACLE, contact; 17 used
P204	15-80215B01	HOUSING, connector-front
	15-80216B01	HOUSING, connector-back
	9-80227B01	CONTACT, female; 2 used
	9-84151B03	RECEPTACLE; 25 used
		mechanical parts
	3-140079	SCREW, tapping; 6-19 x 1/2"; 4 used
	30-812505	CABLE, battery: RED; 22' used
	30-851875	CABLE, battery: BLK; 22' used
	30-83272E01	CABLE, 20" conductor; 22' used
	32-83859M01	GASKET, connector
	36-80220B01	KNOB, connector
	42-80156B01	RETAINER
	54-84032M02	LABEL

TRN5529A Escutcheon No.1
TRN5530A Escutcheon No. 2 — PL-8326-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	5-82781M01	RIVET, nylon; 2 used
	13-84297N01	ESCUTCHEON (TRN5529A)
	13-84297N02	ESCUTCHEON (TRN5530A)
	43-84280N01	SPACER
	64-84279N01	PLATE, escutcheon

Mobile Data Terminal
Interconnect Cabling Diagrams,
Filter Board Schematic Diagram
and Circuit Board Detail,
and Parts Lists
Motorola No. PEPS-32713-A
(Sheet 2 of 3)
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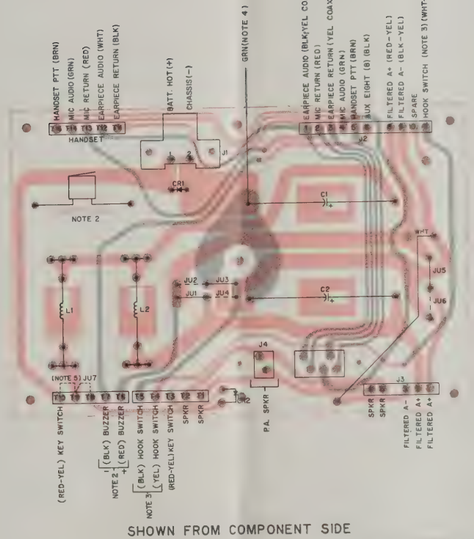


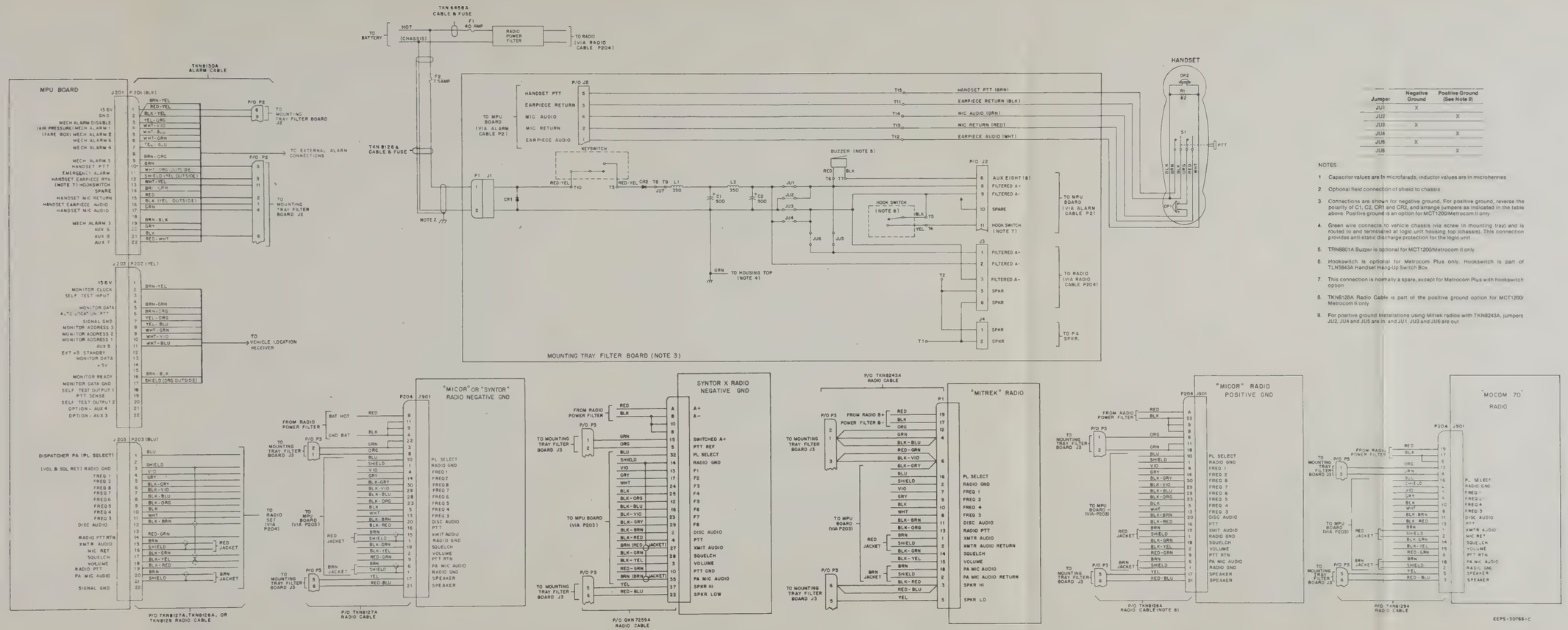
SHOWN FROM COMPONENT SIDE

COMPONENT SIDE@CEPS-30637-O
SOLDER SIDE@CEPS-30638-O
OL CEPS-30639-O

FILTER BOARD

NOTES:

1. Connections are shown for negative ground (TRN4471A). For positive ground (TRN4472A), remove JU1, JU3, and JU5, and install JU2, JU4, and JU6. Reverse polarity of C1, C2, CR1 and CR2. For positive ground installations using MITREK radios with TKN8043A the filter board differs from TRN4472A as follows:
   JU5 — IN
   JU6 — OUT
2. TRN8801 Buzzer is optional for MCT-1200/Metrocom II only.
3. Hookswitch is optional for Metrocom Plus only.
4. GRN wire used in MCT-1200/Metrocom II and Metrocom Plus only. GRN wire connects to vehicle chassis (via screw in mounting tray) and is routed to and terminated at logic unit housing top (chassis). This connection provides anti-static discharge protection for the logic unit.
5. Jumper used in SPU-1200 processor only.



Jumper	Negative Ground	Positive Ground (See Note 9)
JU1	X	
JU2		X
JU3	X	
JU4		X
JU5	X	
JU6		X

NOTES

1. Capacitor values are in microfarads, inductor values are in microhennies
2. Optional field connection of shield to chassis
3. Connections are shown for negative ground. For positive ground, reverse the polarity of C1, C2, CR1 and CR2, and arrange jumpers as indicated in the table above. Positive ground is an option for MCT1200/Metrocom II only
4. Green wire connects to vehicle chassis (via screw in mounting tray) and is routed to and terminated at logic unit housing top (chassis). This connection provides anti-static discharge protection for the logic unit
5. TRN8801A Buzzer is optional for MCT1200/Metrocom II only
6. Hookswitch is optional for Metrocom Plus only. Hookswitch is part of TLN5843A Handset Hang-Up Switch Box
7. This connection is normally a spare, except for Metrocom Plus with hookswitch option
8. TKN8128A Radio Cable is part of the positive ground option for MCT1200/Metrocom II only
9. For positive ground installations using Mitrek radios with TKN8243A, jumpers JU2, JU4 and JU5 are in and JU1, JU3 and JU6 are out

Mobile Data Terminal Interconnect Cabling Diagrams, Filter Board Schematic Diagram and Circuit Board Detail, and Parts Lists
Motorola No. PEPS-32713-A (Sheet 3 of 3)
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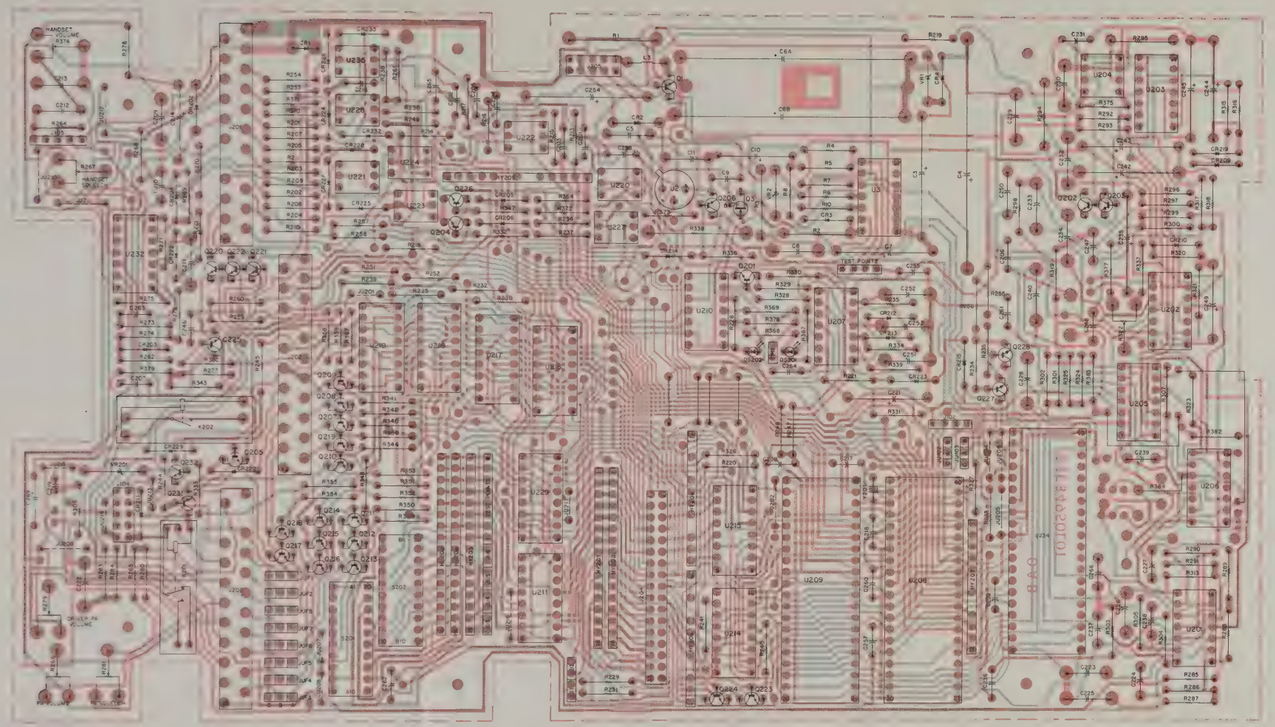

SHOWN FROM COMPONENT SIDE

SOLDER SIDE - 80-EEPS-27644-0
COMPONENT SIDE - 80-EEPS-27645-0
OL-EEPS-27646-E

MPU BOARD

Mobile Data Terminal
Schematic Diagram, Circuit Board Details,
Waveforms, and Parts Lists
Motorola No. PEPS-27741-D
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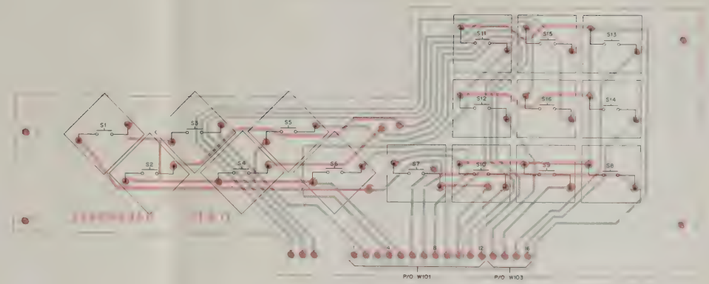
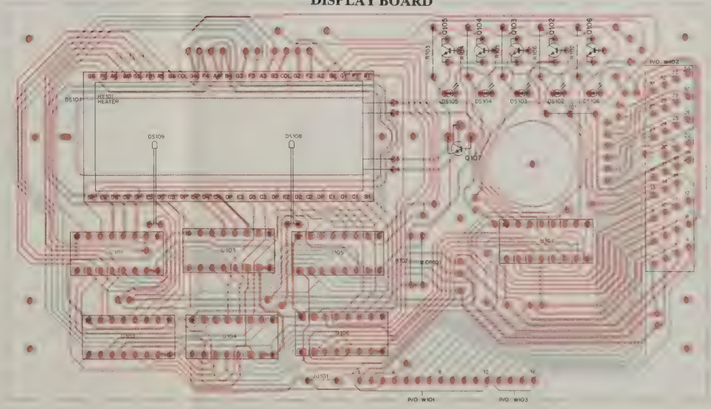
SWITCH BOARD



COMPONENT SIDE - 80-DEPS-27652-0
SOLDER SIDE - 80-DEPS-27653-0
OL-DEPS-27654-B

SHOWN FROM COMPONENT SIDE

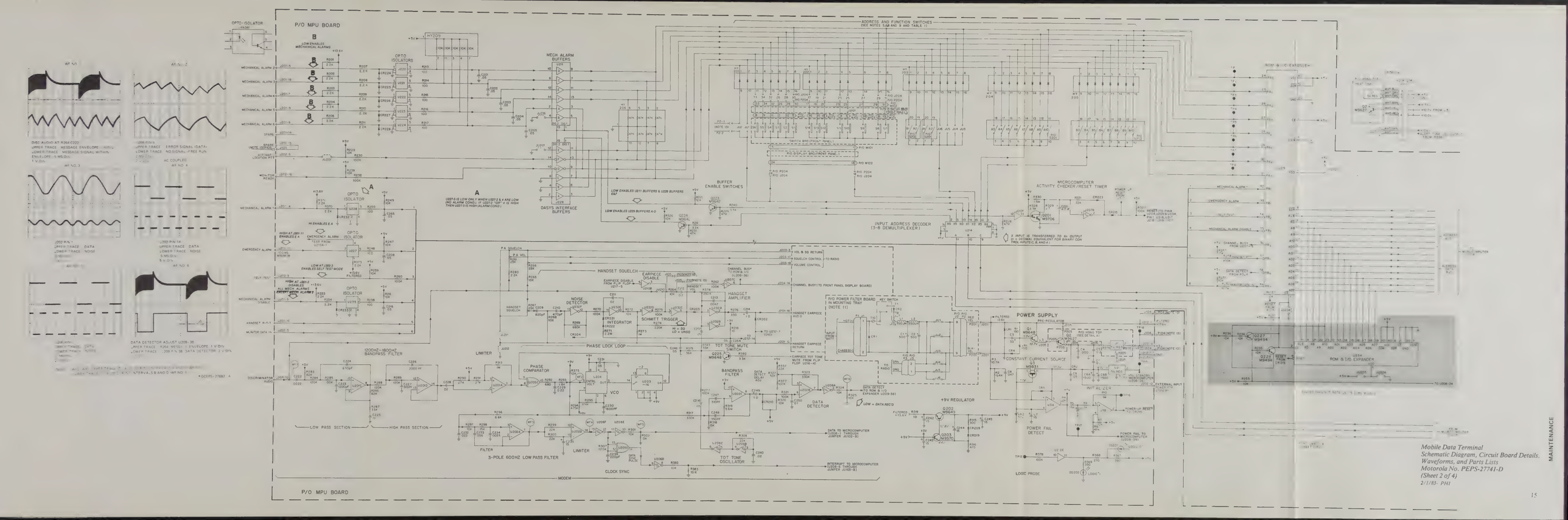
DISPLAY BOARD



COMPONENT SIDE - 80-DEPS-27649-0
SOLDER SIDE - 80-DEPS-27650-0
OL-DEPS-27651-B

SHOWN FROM COMPONENT SIDE

NOTE:
THE TRN8713A DISPLAY AND SWITCH BOARDS WITH OPTIONAL SWITCHES, S9-S16, AND RIBBON CABLE, W103, ADDED ARE SHOWN. REFER TO THE MOBILE DATA TERMINAL SCHEMATIC DIAGRAM FOR DETAILS ON W103 AND S9-S14. (S15 AND S16 ARE FOR FUTURE APPLICATIONS.) THE TRN8718A DISPLAY AND SWITCH BOARDS ARE SIMILAR EXCEPT FOR COMPONENT DELETION. REFER TO THE PARTS LIST FOR DETAILS.



Mobile Data Terminal
Schematic Diagram, Circuit Board Details, Waveforms, and Parts Lists
Motorola No. PEPS-27741-D
(Sheet 2 of 4)
2/1/83- PHI

parts list

TRN8715A MPU Board (6 Alarms) PL-6356-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF + 80-20%; 25 V: unless otherwise stated
C3	23-82783B01	33 ± 20%; 25 V
C4	23-83210A24	1000 + 150-10%; 25 V
C5	21-82372C05	0.2
C6A, B	28-84665F17	1500 + 100-10%; 16 V
C7	23-865136	15 ± 20%; 25 V
C8	8-82905G03	.047 ± 10%; 50 V
C9	21-82372C04	.05
C10	23-82783B10	1.0 ± 20%; 50 V
C11	21-82372C05	0.2
C201 thru 208	21-82372C04	.05
C209	21-82633E08	820 pF ± 5%; 100 V
C210	21-84494B19	470 pF ± 5%; 300 V
C211	8-82905G23	.02 ± 10%; 100 V
C212	21-82372C05	0.2
C213	8-82905G26	.0047 ± 10%; 100 V
C214	23-82783B10	1.0 ± 20%; 50 V
C215		NOT USED
C216	21-82372C04	.05
C217, 218	21-82133G46	24 pF ± 5%; 500 V
C219	23-84908L01	2.2 ± 20%; 50 V
C220		NOT USED
C221	23-865137	4.7 ± 20%; 25 V
C222	8-84496D06	.0022 ± 10%; 630 V
C223	21-84857K02	1200 pF ± 5%; 500 V
C224	21-84494B21	650 pF ± 5%; 300 V
C225	8-82905G01	.01 ± 10%; 50 V
C226	21-84494B54	2000 pF ± 5%; 500 V
C227	21-84494B20	510 pF ± 5%; 300 V
C228	8-82905G23	.02 ± 10%; 100 V
C229	8-82905G11	.22 ± 10%; 50 V
C230	21-84857K10	1800 pF ± 1%; 100 V
C231	21-82372C04	.05
C232	8-82905G02	.022 ± 10%; 50 V
C233	8-82095G18	.056 ± 5%; 200 V
C234	8-82905G25	.0033 ± 10%; 100 V
C235	23-865136	15 ± 20%; 25 V
C236	21-82372C04	.05
C237	21-84857K29	250 pF ± 5%; 500 V
C238	21-84494B30	34 pF ± 5%; 500 V
C239	21-84857K17	220 pF ± 3%; 100 V
C240	8-82905G23	.02 ± 10%; 100 V
C241		NOT USED
C242	23-83210A21	15 + 150-10%; 25 V
C243, 244, 245	23-865136	15 ± 20%; 25 V
C246	21-82372C04	.05
C247	21-84494B20	510 pF ± 5%; 300 V
C248	21-84494B81	390 pF ± 3%; 300 V
C249	23-82783B10	1 ± 20%; 50 V
C250	21-82372C01	0.1
C251	8-82905G03	.047 ± 10%; 50 V
C252	8-84496D06	.0022 ± 10%; 630 V
C253	8-82905G11	0.22 ± 10%, 50 V
C254	23-82783B31	47 ± 20%; 20 V
C255 thru 265	21-82372C04	.05
C266	21-84857K29	250 pF ± 5%; 500 V
C267, 268		NOT USED
C269	23-82783B10	1 ± 20%; 50 V
		diode: (see note)
CR1	48-82525G02	silicon
CR2	48-82466H13	silicon
CR3, 4	48-83654H01	silicon
CR200, 201		NOT USED
CR202	48-82178A01	germanium
CR203	48-83654H01	silicon
CR204	48-84616A01	hot carrier
CR205 thru 214	48-83654H01	silicon
CR215	48-82178A01	germanium
CR216, 217, 218		NOT USED
CR219 thru 229	48-83654H01	silicon
CR230		NOT USED
CR231, 232, 233	48-83654H01	silicon
		light emitting diode:
DS201, 202	48-84404E02	red
		relay:
K201	80-84997G01	1 form "C" coil res 500
K202	80-82617M01	1 form "A" coil res 820
		hybrid, assembly:
HY201 thru 205	1-80710D19	diode network
HY206	1-80712D84	resistor network (47k)
HY207	1-80712D85	resistor network (10k)
HY208	1-80712D84	resistor network (47k)
HY209	1-80712D85	resistor network (10k)
		connector:
J104	28-84528K13	receptacle, male: 10 pin; 2 used
J201, 202, 203	29-84547B03	pins; 80 used
J204	28-84528K12	receptacle, male: 34 pin
J205	28-84528K13	receptacle, male: 10 pin; 2 used
		transistor: (see note)
Q1	48-82954A	NPN; type M9648
Q3	48-82963J	field effect; type M9831

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q201	48-869706	NPN; type M9706
Q202	48-869649	PNP; type M9649
Q203	48-869570	NPN; type M9570
Q204	48-869648	NPN; type M9648
Q205	48-869706	NPN; type M9706
Q206	48-869712	Darlington type M9712
Q207 thru 209	48-869642	NPN; type M9642
Q210 thru 222	48-869648	NPN; type M9648
Q223, 224	48-869642	NPN; type M9642
Q225, 226	48-869648	NPN; type M9648
Q227 thru 230		NOT USED
Q231, 232	48-869706	NPN; type M9706
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-126C29	150 ± 10%; 1 W
R2	6-84640C94	15.4k ± 0.5%
R3	8-84640C83	10.74k ± 0.5%
R4	6-124A81	22k
R5, 6	6-124A77	15k
R7	6-124A75	12k
R8	6-124A49	1k
R9		NOT USED
R10	6-124B22	1 meg
R101		NOT USED
R201 thru 205	6-124A57	2.2k
R206		NOT USED
R207 thru 211	6-124A47	820
R212		NOT USED
R213 thru 217	6-124A25	100
R218, 219	6-124A01	10
R220	6-124A73	10k
R221	6-124A81	22k
R222 thru 224		NOT USED
R225	6-124A73	10k
R226, 227		NOT USED
R228, 229	6-124A89	47k
R230	6-124A97	100k
R231	6-124A89	47k
R232	6-124A97	100k
R233	6-124A73	10k
R234	6-124A48	910
R235, 236		NOT USED
R237	6-124A48	910
R238		NOT USED
R239	6-124A73	10k
R240, 241	6-124A61	3.3k
R242, 243		NOT USED
R244, 245	6-124A61	3.3k
R246		NOT USED
R247	6-124A73	10k
R248	6-124A25	100
R249	6-124A73	10k
R250	6-124A25	100
R251	6-124A73	10k
R252	6-124A97	100k
R253, 254	6-124A57	2.2k
R255 thru 257	6-124A73	10k
R258	6-124A97	100k
R259	6-124A73	10k
R260	6-124A97	100k
R261	6-124A73	10k
R262	6-124A97	100k
R263		NOT USED
R264, 265	6-124A73	10k
R266, 267	18-849444C02	variable, 25k
R268	6-124A73	10k
R269	6-124B18	680k
R270	6-124A97	100k
R271	6-124B30	2.2 meg
R272	6-124A73	10k
R273	6-124B22	1 meg
R274	6-124B06	220k
R275	6-124A97	100k
R276	6-124A37	330
R277	6-124A97	100k
R278		NOT USED
R279	18-84944C12	variable; 5k
R280	6-124A57	2.2k
R281	18-84944C02	variable; 25k
R282, 283		NOT USED
R284	6-124A98	120k
R285		NOT USED
R286	6-124A95	82k
R287	6-124A85	33k
R288, 289	6-124A99	120k
R290, 291	6-124A83	27k
R292	6-124A45	680
R293	6-124A55	1.8k
R294	8-83175C97	4.75k ± 1%
R295	8-83175C22	17.4k ± 1%
R296	6-124A89	6.8k
R297	6-124A73	10k
R298	6-124A77	15k
R299, 300	6-124A81	22k
R301, 302	6-124A73	10k
R303, 304	6-124B22	1 meg
R305	6-124B14	470k
R306	6-124A43	560

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R307	6-124A99	120k
R308 thru 312		NOT USED
R313	6-124B22	1 meg
R314		NOT USED
R315	6-124A38	300
R316	6-124A41	470
R317	6-124B10	330k
R318	6-124A77	15k
R319	6-124B40	5.6 meg
R320	6-124A73	10k
R321	6-124A97	100k
R322	18-84944C13	variable; 50k
R323	6-124B10	330k
R324, 325, 326	6-124A73	10k
R327	6-124A97	100k
R328	6-124A81	3.3k
R329	6-124B55	2.7
R330	6-124B26	1.5 meg
R331	6-124A73	10k
R332	6-124A67	5.6k
R333	6-124A81	3.3k
R334	6-124B22	1 meg
R335	6-124A97	100k
R336	6-124A77	15k
R337	6-124A81	22k
R338		NOT USED
R339	8-124A95	82k
R340, 341, 342	8-124A61	3.3k
R343	6-124A85	33k
R344	6-124A81	3.3k
R345, 346		NOT USED
R347	6-124A67	5.6k
R348 thru 359	6-124A61	3.3k
R360 thru 363		NOT USED
R364	6-124A83	3.9k
R365, 366		NOT USED
R369	6-124A39	390
R368	6-124A35	270
R369	6-124A39	390
R370, 371	6-124A57	2.2k
R372	6-124A63	3.9k
R373	6-124A57	2.2k
R374	18-83944C05	variable; 250k
R375	6-124A75	12k
R376		NOT USED
R377, 378	6-124A97	100k
R379	6-124A91	56k
R380	6-124A61	3.3k
R381		NOT USED
R382, 383	6-124A73	10k
R384	6-124A81	22k
		switch:
S201, 202	40-83022M01	10 position; spst
		integrated circuit: (see note)
U2	51-84371K56	type LM309
U3	51-84371K59	type LM339
U201, 202	51-84371K57	type LM348
U203	51-84561L98	type 74C93
U204	51-84561L23	type 555
U205	51-84561L94	type 74C86
U206, 207	51-84561L93	type 74C14
U208, 209		see TRN8721A ROM
U210	51-84561L97	type 74C906
U211	51-84561L90	type 80C95
U212, 213		NOT USED
U214, 215	51-82884L46	type 4051
U216 thru 219	51-84561L92	type 74C174
U220 thru 224	51-84371K55	type 4N36
U225, 226		NOT USED
U227, 228	51-84371K55	type 4N36
U229	51-84561L96	type 80C97
U230, 231		NOT USED
U232	51-82609M01	type 74C04
U233, 234		NOT USED
U235	51-84371K55	type 4N36
		voltage regulator: (see note)
VR1	48-82256C87	Zener type: 10 V
VR2	48-82256C15	Zener type; 5.1 V
VR201	48-83481E45	Zener type; 25 V
		crystal, microprocessor:
Y201	48-82611M07	5.76 MHz
		mechanical parts
	42-82919H01	CLIP, component mounting
	14-861196	INSULATOR, transistor
	14-84891E01	INSULATOR, stand-off (PB switch)
	43-82786M01	SPACER
	61-82390M01	LENS, led
	3-1960	SCREW, 2-56 x 3/8"; 2 used
	3-134184	SCREW, machine: 4-40 x 5/16"; 4 used
	61-82390M03	LENS, led
	13-82387M02	ESCUTCHEON
	9-84181L01	SOCKET, 2-contact

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-125943	SCREW, machine: 6-32 x 5/16"
	2-7002	NUT, 6-32
	47-84280D01	BERG PIN, male: 50 used
	14-84891E01	SPACER, crystal
	14-861196	INSULATOR, transistor
	4-1725	WASHER, flat: 2 used
	9-82601M01	IC SOCKET, microprocessor: 40 pin

NOTE: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN8721 Microcomputer and ROM with I/O PL-6366-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		integrated circuit: (see note)
U208	51-82609M13	type 8048
U209	51-82609M14	type 8355

TRN8713A Display and Switch Boards PL-6361-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C101	21-84448K03	0.1 uF + 80-20%; 50 V
		light emitting diode: (see note)
DS102 thru 106	48-88245C20	red
		transistor: (see note)
Q102 thru 106	48-869642	NPN; type M9642
Q107	48-869806	NPN; type M9806
		resistor, fixed:
R102 thru 106	6-124A43	560 ± 5%; 1/4 W
R107	6-124A35	270 ± 5%; 1/4 W
		switch:
S1 thru 8	40-82765M01	momentary, spst.
		integrated circuit: (see note)
U101 thru 106	51-82884L50	type M84L50
U107	51-84561L92	type M61L92
		voltage regulator:
VR101	48-82256C51	Zener type: 5.1 V; 1 W
		cable:
W101	30-82849M01	flat w/connector; 12-conductor
W102	30-82850M01	flat w/connector; 34-conductor
W103	30-82849M02	flat w/connector; 4-conductor (option D335A A only)
		mechanical parts
	4-858060	WASHER, insulator; 5 used
	14-83998K02	INSULATOR

TRN8718A Display and Switchboards PL-6481-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C101	21-84448K03	.1 uF + 80-20%; 50 V
		light emitting diode: (see note)
DS102	48-88245C20	red
DS103		NOT USED
DS104 thru 106	48-88245C20	red
		transistor: (see note)
Q102, 104, 105, 106	48-869642	NPN; type M9642
Q107		NOT USED
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R102, 103, 104	6-124A43	560
R105		NOT USED
R106	6-124A43	560
R107		NOT USED
		switch:
S7, 8	40-82765M01	momentary, spst
		integrated circuit: (see note)
U107	51-84561L92	type 74C174
		cable:
W101	30-82849M01	flat w/connector; 12-conductor
W102	30-82850M01	flat w/connector; 34-conductor

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers only.

THN8382A & THN8390A Housing Top PL-6368-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		spaaker:
LS201	50-82225L01	8 ohms dia. 1.57"
		transistor: (see note)
Q2	48-869627	NPN; type M9627
		integrated circuit: (see note)
U1	51-82609M15	type 09M15
		connector, receptacle: Includes:
P205	14-84277D18	housing, connector; 10-contact
	9-84279D01	female: 8 contacts
	22-84535F01	pin, polarizing
		mechanical parts
	3-134268	SCREW, tapping: 4-40 x 7/16"; 2 used
	3-136253	SCREW, machine: 6-32 x 5/8"; 4 used
	9-82673A01	SOCKET, transistor: 2 used
	13-82638M01	GRILLE, speaker
	14-865854	INSULATOR, transistor: 2 used
	15-82287M01	HOUSING, top (THN8382A)
	32-82788M03	GASKET
	32-84913D02	GASKET, speaker
	42-82688M01	CLIP, speaker; 2 used
	42-01217A18	STRIP, tie; 2 used
	15-82287M03	HOUSING, top (THN8390A)
	32-82817N01	GASKET; 32 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers only.

TRN8714A Front Panel Hardware PL-6363-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		lamp, miniature:
DS101, 109	65-83479E03	12 V; clear; type 7219
DS107	72-82008M02	liquid crystal display
		hybrid:
HY101	1-80712D89	LCD heater: Includes RT101
RT101	8-84348L02	thermistor, 20 @ 25 °C
		mechanical parts
	2-7041	NUT, 2-56 x 3/16 x 1/16"; 2 used
	3-1523	SCREW, machine: 2-56 x 7/16"; 2 used
	4-8406	WASHER, lock #2 internal; 2 used
	7-82690N01	PANEL
	13-82331M01	BEZEL
	28-82028M02	CONNECTOR; 2 used
	28-82778M01	CONNECTOR; plug
	32-82165M03	GASKET, LED, housing; 2 used
	42-82330M01	RETAINER
	61-82814N01	LENS, LCD

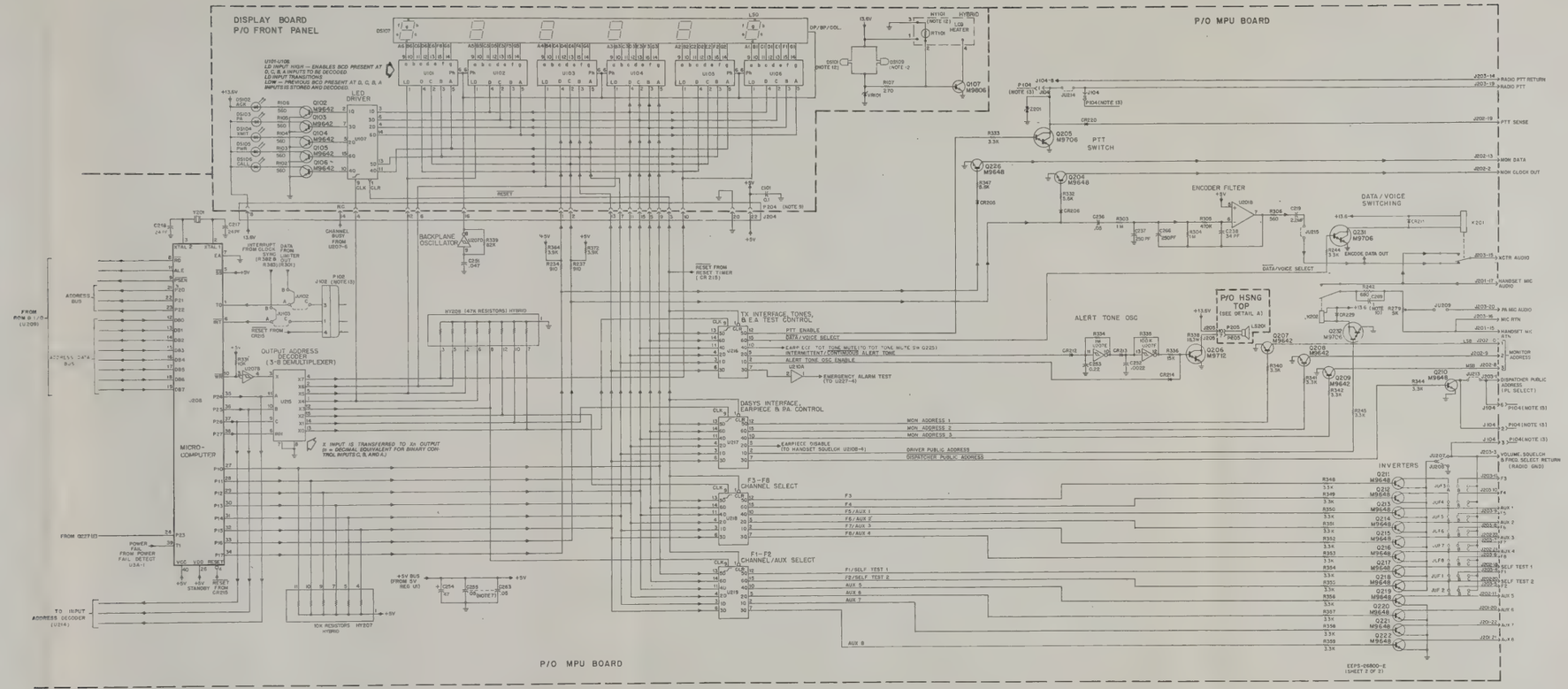
TRN8719A Front Panel Hardware Kit PL-6482-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	7-82690N01	BRACKET, frame
	5-82781M01	RIVET, nylon; 2 used
	28-82778M01	CONNECTOR, plug

TRN8797A Tray and Hardware Option Kit PL-6608-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, receptacle:
J1	9-82672G01	female; 6-contact
		switch:
S1	40-82220H01	spst
		mechanical parts
	2-482070	NUT, ring
	2-121841	NUT, 6-32 x 5/16 x 7/64"; 4 used
	3-135506	SCREW, tapping: 6-32 x 1/4"; 4 used
	3-136851	SCREW, machine: 10-32 x 3/8"; 4 used
	3-136993	SCREW, machine: 6-32 x 3/8"; 2 used
	4-1719	WASHER, flat: .141 x .375"; 3 used
	7-83248L01	BRACKET, alarm
	4-1725	WASHER, flat: .266 x .562 x .040"; 2 used
	4-129021	LOCKWASHER, 3/4" internal: 2 used
	42-861179	CLAMP, cable
	42-10217A02	STRAP, tie
	42-82143C02	CLIP, cable; 2 used
	55-84737L04	LOCK
	5-10115A43	GROMMET, rubber
	4-873839	WASHER, spring; 2 used
	7-82305M03	TRAY, mounting
	41-84756L01	SPRING; 2 used
	42-10128A15	RING, retainer; 4 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers only.



NOTES:

1. UNLESS OTHERWISE INDICATED RESISTOR VALUES ARE IN OHMS CAPACITOR VALUES ARE IN MICROFARADS.
2. THIS DIAGRAM USES POSITIVE LOGIC. DEFINED LOGIC LEVELS ARE AS FOLLOWS:
   HIGH (1) LOGIC LEVEL ≥ 3.5 VOLTS
   LOW (0) LOGIC LEVEL ≤ 1.5 VOLTS
3. SOME INTEGRATED CIRCUITS ON THIS BOARD ARE CMOS DEVICES.
4. INTEGRATED CIRCUITS POWER/GROUND CONNECTIONS ARE AS FOLLOWS:

REFERENCE DESIGNATION	TYPE	+5V	GND	MPGP S DESCRIPTION	+8V
U1	LM309			5 V REG	
U2	LM309			5 V REG	
U3	LM339			COMPARATOR	
U101, 102, 103, 104, 105, 106	4543	16	7,8	LCD DRIVER	
U107, 215, 217, 218, 219	74C174	16	8	HEX D FLIP-FLOP	
U201, 202	LM340	—	1	CHPD AMPL	4
U203	74C90	—	11	COUNTER	4
U204	NJ590	—	1	TIMER	8
U206	74C86	—	7	EXCL OR	14
U208, 209	74C14	14	U209 7	SCHMITT TRIG	14 U208
U208, 254	8048 8355	40 40	20 20	MICROCOMPUTER ROM & I/O EXPANDER	
U210	74C928	14	7	HEX BUFFER	
U211	80C95	16	8	HEX 3-STATE BUFFER	
U214, 213	4051	16	7,8	3-8 ANALOG MUX	
U229, 221, 222, 223, 224, 227, 228, 230	4N36		2,4	OPTO-ISOLATOR	
U228	80C97	16	8	HEX 3-STATE BUFFER	
U233	74C04		7	HEX INVERTER	14

5. MPU BOARD JUMPER CONNECTIONS AND USAGE ARE AS FOLLOWS:

JUMPER	FUNCTION
JUP 1 THRU JUP8	FOR REMOTE FREQUENCY SWITCHING: PINS A AND B SHOULD BE CONNECTED BY JUMPER TO CONNECTOR J1 FOR ALL THE FREQUENCIES TO BE USED. ALL OTHER JUMPERS SHOULD BE OUT. FOR FIXED FREQUENCY SELECTION: PINS B AND C SHOULD BE CONNECTED BY ONE JUMPER CORRESPONDING TO THE FREQUENCY TO BE USED. ONLY ONE FREQUENCY MAY BE USED. ALL OTHER JUMPERS SHOULD BE OUT
JU1	SPARE
JU2	NUMBER OF GROUP CALL COMPARATION: I/O DIGITS — IN FOR THREE MOST SIGNIFICANT DIGITS. OUT FOR THREE MOST SIGNIFICANT DIGITS
JU3	DATA CHANNEL KEYUP DELAY — IN FOR 100 MILLISECOND DELAY OUT FOR 50 MILLISECOND DELAY
JU4	VOICE CHANNEL KEYUP DELAY — IN FOR 425 MILLISECOND DELAY OUT FOR 250 MILLISECOND DELAY
JU5	NUMBER OF REMOTE SELECTABLE FREQUENCIES — IN FOR 8 FREQUENCIES OUT FOR 4 FREQUENCIES
JU6	SPARE
JU101	ASSIGNED ON DISPLAY BOARD. DRIVER P.A. ENABLE — IN JUMPER OUT FOR DISABLE
JU102, JU103	JUMPERS NORMALLY CONNECT POINT A TO POINT B FOR SELF TEST MANUAL MODE CONNECT POINT A TO POINT C
JU201	LOCATION PTT — NO EFFECT EXCEPT WHEN DATA TERMINAL IS USED WITH OPTIONAL VEHICLE LOCATION PROCESSING UNIT. THEN JUMPER MUST BE IN
JU202	IN WHEN USING 8755A EPROM AT U209. OUT WHEN USING 8355 ROM AT U209
JU204	MEMORY CAPACITY — IN FOR 3K BYTE (NORMAL CONDITION IF U234 IS NOT USED). OUT FOR 2K BYTE WHEN U234 IS USED
JU205 & JU206	MONITOR ENABLE/DISABLE — FOR ENABLE: JU205 IN AND JU206 OUT. FOR DISABLE: JU205 OUT AND JU206 IN (BOTH JUMPERS MUST NEVER BE IN AT THE SAME TIME)
JU207 & JU208	REMOTE FREQUENCY SELECTION — FOR NEGATIVE GROUND: JU207 IN AND JU208 OUT. FOR POSITIVE GROUND: JU207 OUT AND JU208 IN
JU209	DRIVER P.A. — IN ENABLES OUT DISABLES
JU210	EARPIECE AUDIO — IN FOR NEGATIVE GROUND. OUT FOR POSITIVE GROUND OPTION. REMOVE JU210 AND R264 AND IN JU211 AND R265
JU211 & JU212	EARPIECE AUDIO RETURN — FOR NEGATIVE GROUND: JU211 IN AND JU212 OUT. FOR POSITIVE GROUND OPTION JU211 OUT AND JU212 IN
JU213	DISPATCHER P.A. — IN FOR NEGATIVE GROUND OUT FOR POSITIVE GROUND OPTION
JU214	RADIO PTT — IN FOR NEGATIVE GROUND OUT FOR POSITIVE GROUND OPTION
JU215	ENCODE DATA OUTPUT — IN FOR ENCODE DATA OUTPUT OUT FOR NO ENCODE DATA OUTPUT
JU216	MECHANICAL ALARM 7 ENABLE — IN FOR DISABLE OUT FOR ENABLE
JU217	MECHANICAL ALARM 8 ENABLE — IN FOR DISABLE OUT FOR ENABLE

6. SWITCHES S1 THROUGH S14 ARE PUSHBUTTON SWITCHES MOUNTED ON THE FRONT PANEL.
7. C255 THROUGH C264 ARE .05 UF BYPASS CAPACITORS WHICH ARE CONNECTED TO THE +5 V BUS ADJACENT TO THE VARIOUS INTEGRATED CIRCUITS.
8. J1 WITH 15 CONDUCTOR GRAY RIBBON CABLE W103 IS A CONDUCTOR GRAY RIBBON CABLE AND IS USED ONLY WITH OPTION 0339AA MESSAGE CAPABILITY.
9. P104 CONNECTS MPU BOARD TO DISPLAY BOARD VIA 34 CONDUCTOR RIBBON CABLE W100.
10. C269 USED WITH MODEM RADIOS. R242 IN PLACES C269 IN MODEM 70 RADIO.
11. CONNECTIONS ARE SHOWN FOR NEGATIVE GROUND FOR POSITIVE GROUND RADIOS THE POLARITY OF C1, C2 AND CR1 REMOVE JU1, JU2, AND JU3 AND INSERT JU1 JU4 AND JU5. REFER TO INTERCONNECT CABLING DIAGRAM FOR FURTHER CIRCUIT DETAILS ON FILTER BOARD.
12. IN U101, DE101, AND DS109 ARE PART OF 19149714A FRONT PANEL HARDWARE.*

*TABLE — ADDRESS AND FUNCTION SWITCHES

SWITCH NO.	FUNCTION
S1 THRU S6	CONTROLS S1 THRU U106 RESPECTIVELY
S7	REQUEST TO TALK
S8	PRIORITY REQUEST TO TALK
S9	OPTION 0338AA MESSAGE CAPABILITY
S10	OPTION 0339AA MESSAGE CAPABILITY
S11 THRU S16	FIXED IDENTITY

NOTE: S1 THRU S10 F, S10 (S11*)

13. R2 P102 P104 AND P105 ARE USED ONLY FOR SPECIAL APPLICATIONS

Mobile Data Terminal
Schematic Diagram, Circuit Board Details, Waveforms, and Parts Lists
Motorola No. PEPS-27741-D
(Sheet 4 of 4)
2/1/83- PH1

MAINTENANCE

parts list

TRN4239A Positive Ground Board — PL-6714-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR300-309	48-83654H01	diode: (see note) silicon
J301	28-84528K12	connector, receptacle male, 34-contact
K300 thru 309	80-82617M01	relay: spst
T301	25-84007C01	transformer: audio

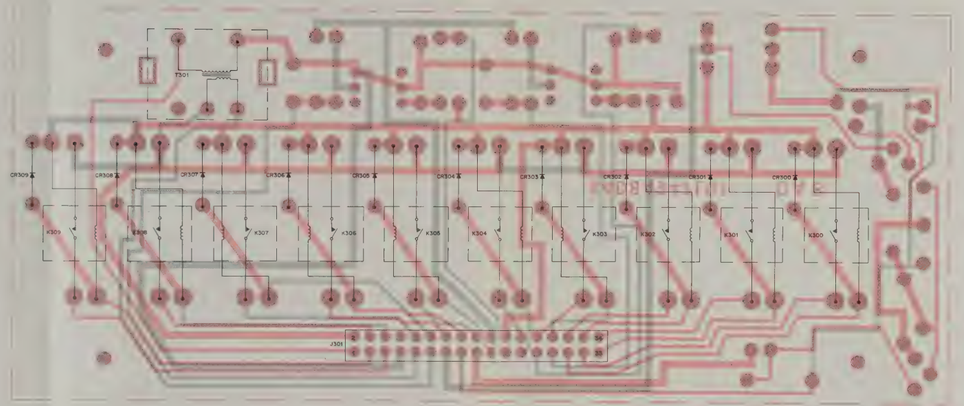
TRN8077A Cable Kit — PL-6715-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
P104		connector, plug consists of: 14-84277D18 HOUSING, connector: 10-contact 22-84835F01 PLUG, polarizing 9-84279D01 LUG, female; 8 used
P105		consists of: 14-84277D26 HOUSING, connector: 5-contact 22-84835F01 PLUG, polarizing 9-84279D01 LUG, female; 2 used
P301		consists of: 14-84277D24 HOUSING connector: 34-contact 22-84835F01 PLUG, polarizing 9-84279D01 LUG, female; 26 used
PF1 thru PF8		consists of: 14-84277D25 HOUSING, connector: 2 contact 9-84279D01 LUG, female; 2 used
		non-referenced items
	42-10217A02	TIE STRAP

TRN4240A Positive Ground Hardware Kit — PL-6716-O

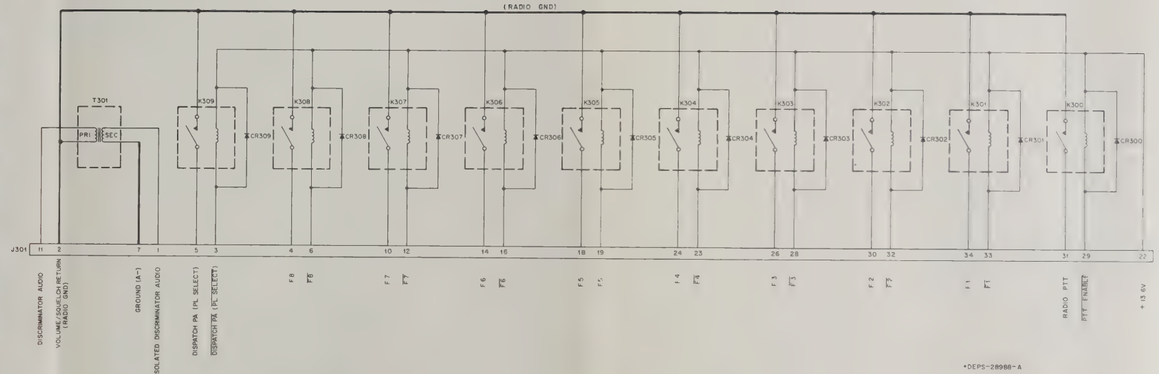
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-135506	SCREW, tapp-rig, 6-32 x 1/4", 4 used
	54-84156D01	LABEL, positive ground, 3 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers



SHOWN FROM COMPONENT SIDE

SOLDER SIDE — 80-DEPS-28989-O
COMPONENT SIDE — 80-DEPS-28990-O
OL-DEPS-28991-O



*DEPS-28988-A

TRN4239A Positive Ground Board
Schematic Diagram, Circuit Board Detail,
and Parts Lists
Motorola No. PEPS-28993-A
9/1/81- PHI

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AVAILABLE BACKGROUND REFERENCE PUBLICATIONS

Five reference publications are available to provide background information needed to service some of the newer Motorola products more effectively. The information in these publications is not duplicated in our instruction manuals. To obtain your free copy, check the ones you want and return this self-mailer to us. (NOTE: One copy of each publication has already been distributed to Motorola Service Shops (MSS's) and field technical representatives (FTR's).

Check item desired:

☐ **Basic Logic Circuit Guide** — 68P81105E88
Describes the basic logic circuits used in Motorola Communications digital equipment and the logic notational scheme used in our instruction manuals.

☐ **"Digital Private-Line" Binary-Coded Squelch** — 68P81106E83
Contains fundamentals of "Digital Private-Line" system operation, circuit operation and servicing techniques.

☐ **Safe Handling of CMOS Integrated Circuit Devices** — 68P81106E84
Describes special handling techniques needed to prevent irrepairable damage from static charges encountered with normal handling of CMOS devices.

☐ **Reducing Noise Interference in Mobile Two-Way Radio Installations** — 68P81109E33
Defines the major sources of noise encountered in a mobile radio installation and suggests methods of remedying them.

☐ **Anti-Skid Braking Precautions** — 68P81109E34
Provides installation suggestions and a detailed checkout procedure for installation of mobile radios in vehicles with anti-skid braking systems.

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USER QUESTIONNAIRE

To the User of This Instruction Manual:

Motorola is engaged in a continuous program of improving its instruction literature. We believe that you can aid us in this program, so that we in turn can better help you service our equipment. To foster these aims, would you please answer the following questions:

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4. ☐ Are difficult to follow

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